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**TECHNICAL REPORT**

**GTS Data Pre-Processing and Archival System  
at NCMRWF**

**V.S. Prasad**

**January 2020**

**National Centre for Medium Range Weather Forecasting  
Ministry of Earth Sciences, Government of India  
A-50, Sector-62, Noida-201 309, INDIA**

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10	Abstract	<p>The GTS data pre-processing and archival system is modified to make it more transparent and usable. In the earlier version data is stored mainly in half-an-hour bins based on the arrival time and calendar date. Further miscellaneous datasets such as Radar data from India Meteorological Department (in DWR sub-directory), AHI radiance data from Japan Meteorological Agency (in mtsat subdirectory) and rest of data (in MISC subdirectory) are kept in their respective directories within date-wise directory. In the proposed archival system, the GTS messages are separated into GTS bulletins and each bulletin is archived as a separate file with a name based on its GTS header. Then they are archived in different sub-directories created with first two letters of their bulletin header and these sub-directories are placed on calendar date wise directory that is created based on the time that is in bulletin header (Time of bulletin origin).</p> <p>The details of data stored from the bulletin can be inferred from the file name and using Annexure 1 and 2 given at the end of report. These annexures are based on WMO documents.</p>
11	Security classification	Non-Secure
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## Table of Contents

<b>Sl. No.</b>	<b>Content</b>	<b>Page No</b>
1	Abstract	4
2	Introduction	5
3	Brief Description of WMO's GTS	6
4	GTS Data Archival	8
5	GTS Data Decoding	8
6	References	9
7	Annexure-1	19
8	Annexure-2	43

## **Abstract**

The GTS data pre-processing and archival system is modified to make it more transparent and usable. In the earlier version data is stored mainly in half-hourly bins based on the arrival time and calendar date. Further miscellaneous datasets such as Radar data from India Meteorological Department (in DWR sub-directory), AHI radiance data from Japan Meteorological Agency (in mtsat subdirectory) and rest of data (in MISC subdirectory) are kept in their respective directories within date wise directory. In the proposed archival system, the GTS messages are separated into GTS bulletins and each bulletin is archived as a separate file with a name based on its GTS header. Then they are archived in different sub-directories created with first two letters of their bulletin header and these sub-directories are placed on calendar date wise directory that is created based on the time that is in bulletin header (Time of bulletin origin).

The details of data stored from the bulletin can be inferred from the file name and using Annexure I and II that at end of report. These annexures are based on WMO documents.

## 1. Introduction

National Centre for Medium Range Weather Forecasting (NCMRWF) is mandated to generate initial conditions for atmospheric models that are routinely run by the various other centers of Ministry of Earth Sciences, Government of India. These models are based either on NCEP's GFS (Global Forecast System) or UK Met Office's Unified Model (UM) system. As a part of this mandate NCMRWF has made an extensive arrangement to receive atmospheric and ocean observational data from most of the Global Data centers. The conventional observations are received via Global Telecommunications System (GTS) network of World Meteorological Organisation (WMO), through its Regional Telecommunication Hub (RTH) at India Meteorological Department (IMD), New Delhi. For receiving bulk satellite datasets, NCMRWF has established data links with Global Satellite operators such as NOAA, EUMETSAT, CMA, KMA and ISRO etc. This report focuses on the receiving, processing and archival of data received through GTS.

NCMRWF initially used GTS data decoders that were developed at ECMWF and stored the data in some type of RDBMS format. Later in 2007, the decoders were replaced with that of the NCEP (USA) based data processing system. In this system the processed data is stored in special directory structure and it is called as "BUFR-TANK" (Rajagopal et al., 2007). In both the data processing systems, the received GTS data is at the first place binned into half-hourly subdirectories with filenames as transmitted by RTH-New Delhi first and later on all data is subjected to a chain of data decoders. This data decoding system consists of number of data decoders, each specialized to one particular type of dataset. It means all datasets flow through all the decoders for decoding. Then, a particular decoder picks up all data that is related to it and decodes. In this process, the data availability to the analysis system is delayed by more than half-an-hour, which is mainly due to above mentioned data binning methodology wherein all decoders read all the files unnecessarily.

Prasad et.al. (2011) completely overhauled the NCMRWF data pre-processing and decoding system by organizing it into a modular system. It enabled NCMRWF to upgrade the data processing system at frequent intervals and it also allowed porting the decoding system on various computing platforms including Linux desktops. Further, NCMRWF developed decoding modules for various new Indian datasets such as Oceansat Scatterometer, MT-SAPHIR, INSAT 3D & 3DR radiance AMV and GNSS Precipitable Water vapour and DWR radial & reflectivity etc. After successful implementation of the UM based Global Data Assimilation and Forecasting System at NCMRWF, this revised data processing system was extended to generate input observational data in a format that is compatible to UM system, viz., "OBSTORE" (Prasad, 2012).

Recently, it was decided to introduce early cycle runs at NCMRWF with a two-hour cut-off time to make NWP products available to the operational forecasters before they prepare final forecasts. To achieve this goal the data binning and decoding is separated and near real time data decoding was introduced in the year 2018. Further, in this modification the data archival is modified by dropping half hourly binning and introducing sub-directory structure based on GTS message header information and also to speed-up decoding, the GTS messages of each particular data type are selected and then sent to the decoder system that decodes this particular data type. This process has an advantage that headers of all data sets that are being received through GTS are known explicitly and some more time will be gained in the completion of decoding process. The details of the present implementation are discussed in the report.

## **2. Brief Description of WMO's GTS**

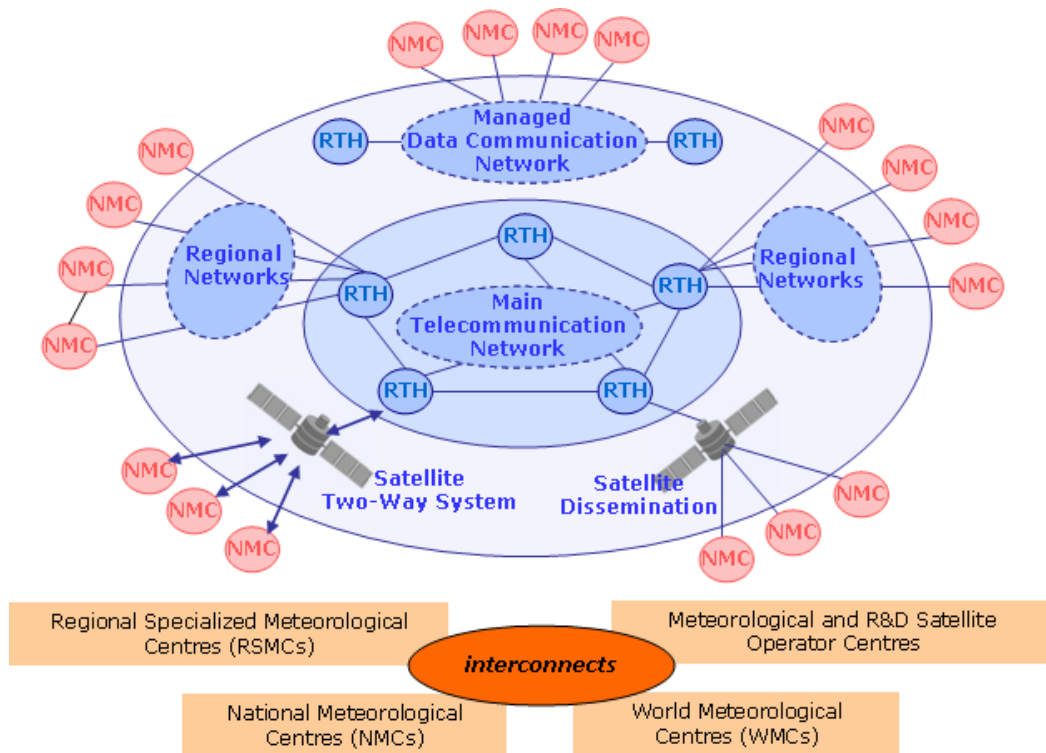
GTS is the communication and data management component of WMO's World Weather Watch (WWW) program. It allows the collection and distribution of information critical to weather process. It is implemented and operated by WMO members (National Meteorological Services) and International organisations such as ECMWF and EUMETSAT. The GTS has a hierarchical structure on three levels:

Level 1: The Main Telecommunication Network (MTN), linking together three World Meteorological Centres (WMCs) (Melbourne, Moscow and Washington)

Level 2: 15 Regional Telecommunication Hubs (RTHs) (Algiers, Beijing, Bracknell, Brasilia, Buenos Aires, Cairo, Dakar, Jeddah, Nairobi, New Delhi, Offenbach, Toulouse, Prague, Sofia and Tokyo).

Level 3: The National Meteorological Telecommunication Networks (NMTNs) enable the National Meteorological Centres (NMCs) to collect and receive observational data and distribute meteorological information on a national level.

NCMRWF has access to this GTS from RTH-New Delhi through National Knowledge Network (NKN) connectivity and a normal internet FTP access as a fallback option. NCMRWF receives the GTS data as two types of continuous messages; one is alphanumeric numerical channel and the other is binary channel. Both type of the messages starts with an "abbreviated header" and have a fixed structure as shown in Table 1 and the full details of the GTS header are included in Annexure-1 and 2. Apart from passing GTS messages, RTH-New Delhi also sends some special data to NCMRWF through the same communication channel. It includes RARS data from Australia & Japan, Indian Doppler Weather Radar (DWR) observations and Himawari-8 radiances from JMA, Japan.



**Figure 1: Structure of the Global Telecommunication System**

(Courtesy: [https://www.wmo.int/pages/prog/www/TEM/GTS/index\\_en.html](https://www.wmo.int/pages/prog/www/TEM/GTS/index_en.html))

**Table 1: The Structure of a GTS message**

Format for an alphanumeric virtual channel	Format for and binary virtual channel
(SOH)(CR)(CR)(LF) nnn (CR)(CR)(LF) BMRR01 CCCC YYGGgg (CR)(CR)(LF) CCCC (CR)(CR)(LF) SQN nnn- <i>nnn</i> = [a seq. of bulletins] (CR)(CR)(LF)(ETX)	(SOH)(CR)(CR)(LF) nnn (CR)(CR)(LF)IXCN46 CCCC YYGGgg (CR)(CR)(LF) CCCC (CR)(CR)(LF) SQN nnn- <i>nnn</i> = [a seq. of bulletins] (CR)(CR)(LF)(ETX)
Both type of message starts with the following abbreviated heading:  T1T2A1A2ii CCCC YYGGgg	
WHERE: (CR) = Carriage Return (LF) = Line Feed (SOH) = Start of header control character (ETX= End of text control character	
T1T2	BM designator for message in alphanumeric form ( <b>T1 = A, C, D, F, G, K, L, N, O, P, Q, S, T, U, W, X or Y</b> ) BI designator for addressed message in binary form( <b>T1 = H, I, J</b> )
A1A2	Geographical designators
i	Level designator
CCCC	international location indicator of the center originating the message



### **3. GTS Data Archival**

RTH-New Delhi continuously pushes the GTS data in two streams, viz., ASCII and binary, through both the FTP and NKN links on to the respective servers at NCMRWF. These downloaded directories are synchronized with the Mihir HPCS and hence GTS files are transferred automatically to separate temporary directories. The data files thus received are read by taking GTS message structure into consideration and then separated to a single bulletin. These bulletins are then archived as separate file in a designated archive directory which is based on first two letters of header (T1T2) and last four digits of header that are related to the time of origin of bulletin. These files are named by using their bulletin headers, bulletin serial number and with a suffix “.bul” and archived in a subdirectory that created based on first two letters of header [e.g., AA,AB,..... UW] which in turn are placed in a directory that is based on date of origin of bulletin (in YYYYMMDD format) and the whole structure is available at “/home/gfsprod/data/gts” in Mihir HPCS (e.g., /home/gfsprod/data/gts/ IUPD53\_EDZW\_201118\_334.bul). While separating GTS messages into separate bulletins, a list of files is maintained for data decoding purpose.

A part from GTS messages, the data stream from RTH-New Delhi contains the Asia-Pacific RARS data, radiance data from HIMAWRI-8 and Doppler Weather Radar (DWR) data from IMD’s network. The first two are stored in DBNET, MTSAT and the DWR data in DWR and which in turn divided into station wise sub-directories.

### **4. GTS Data Decoding**

Presently RTH-New Delhi is receiving GTS messages from many WMO data centers that spread all over the globe and the list of these centers are tabulated in Table 2 in the form of CCCC. These messages carry different type of datasets as listed in Table3 in the form of T1T2A1A2. The expansion of these abbreviations can be found in the WMO document –“Catalogue of Meteorological bulletins” (Volume C1). Out many data types that are received, NCMRWF is interested in only 16 types of datasets only (Table 4). The NCEP decoders for decoding the GTS datasets that are implemented on Mihir HPC are tabulated in Table 5. In the previous implementation all the received BUFR messages were being passed through the all decoders and the respective decoders used to pick the data of their type. Now it is found that this process can be avoided to save time in data processing and decoding. As only few datasets are required, codes/scripts were developed to pick up the particular data and send only it to the corresponding decoder. In implementing this approach, the archival method was also modified so that datasets are stored by data and its type (first two letters of header T1T2). This new implementation will also help easily to shift to upcoming WMO’s WIS programme and also help in easily picking original GTS bulletin for a required data.

## 5. References

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**Table 2: The List of GTS data originating Centers (CCCC) from which datasets are received at NCMRWF (as in November 2019)**

ABRF	ADRM	AFHQ	AGGH	AMHF	AMMC	AMRF	APRF	AYPM	BABJ
BAWX	BGGH	BGSF	BIBD	BICC	BIEG	BIHN	BIIS	BIKF	BIRK
BIVM	BKPR	BTBH	CAWE	CAYT	CIMA	CWAE	CWAO	CWEG	CWEU
CWHX	CWLT	CWMW	CWOW	CWQI	CWSE	CWSW	CWTO	CWUL	CWVK
CWVR	CWZC	CYAB	CYAH	CYAM	CYAS	CYAY	CYAZ	CYBB	CYBC
CYBD	CYBG	CYBK	CYBL	CYBR	CYBV	CYBX	CYCB	CYCD	CYCG
CYCO	CYCP	CYCQ	CYCS	CYCX	CYCY	CYDA	CYDB	CYDC	CYDF
CYDN	CYDP	CYDQ	CYEG	CYEK	CYEV	CYFB	CYFC	CYFO	CYFR
CYFS	CYFT	CYGE	CYGH	CYGK	CYGL	CYGP	CYGQ	CYGR	CYGT
CYGV	CYGX	CYHA	CYHD	CYHE	CYHI	CYHK	CYHM	CYHU	CYHY
CYHZ	CYIK	CYIO	CYIV	CYJF	CYJT	CYKA	CYKF	CYKG	CYKL
CYKO	CYKQ	CYKY	CYLA	CYLC	CYLD	CYLJ	CYLK	CYLL	CYLU
CYLW	CYMA	CYMJ	CYMM	CYMO	CYMU	CYMX	CYNA	CYNC	CYND
CYNE	CYNM	CYOC	CYOJ	CYOW	CYPA	CYPC	CYPE	CYPH	CYPL
CYPQ	CYPR	CYPW	CYPY	CYQA	CYQB	CYQD	CYQF	CYQH	CYQI
CYQK	CYQL	CYQM	CYQR	CYQT	CYQU	CYQW	CYQX	CYQY	CYRA
CYRB	CYRJ	CYRL	CYRT	CYSB	CYSJ	CYSK	CYSM	CYSN	CYSP
CYSY	CYTE	CYTH	CYTL	CYTQ	CYTR	CYTS	CYUB	CYUL	CYUT
CYUX	CYUY	CYVC	CYVM	CYVO	CYVP	CYVQ	CYVR	CYVV	CYWG
CYWH	CYWJ	CYWK	CYWL	CYXC	CYXE	CYXH	CYXJ	CYXL	CYXN
CYXP	CYXQ	CYXS	CYXT	CYXU	CYXX	CYXY	CYXZ	CYYB	CYYC
CYYD	CYYE	CYYF	CYYG	CYYH	CYYJ	CYYL	CYYQ	CYYR	CYYT
CYYU	CYYY	CYYZ	CYZE	CYZF	CYZG	CYZS	CYZT	CYZU	CYZV
CYZW	CYZX	CYZY	CZEM	CZFA	CZFM	CZFN	CZMT	CZST	CZXS
DAAA	DAMM	DBBB	DEMS	DFFD	DGAA	DIAP	DKPY	DNAA	DNKN
DNMM	DNPO	DRRN	DTTA	DXXX	EBBR	EBUM	EBWM	ECEP	ECMF
EDLR	EDZB	EDZE	EDZF	EDZH	EDZM	EDZO	EDZW	EEMH	EETN
EFKL	EGGY	EGRR	EGYP	EHDB	EIDB	EKCH	EKMI	ELLX	ENHO
ENMI	EPWA	EQGA	ESWI	EUMG	EUMS	EVRA	EYHM	EYVI	FABL
FAGE	FAME	FAOR	FAPE	FAPR	FASE	FAUT	FBSK	FCBB	FDMS
FEFF	FGSL	FHAW	FIMP	FKKD	FLKK	FLLS	FMCH	FMCZ	FMEE
FMMD	FMMI	FMNM	FNLU	FOOL	FQMA	FSIA	FTTJ	FWCL	FXMM
FYWW	FZAA	GABS	GBYD	GCLP	GCXO	GGOV	GLRB	GMMC	GOOY
GQPP	GUCY	GVAC	GVBA	GVNP	GVSU	HAAB	HABP	HCMM	HDAM
HECA	HKNA	HKNC	HLMC	HRYR	HSSJ	HSSS	HTDA	HUEN	KARP
KAWN	KBWL	KDDL	KKCI	KMSC	KNAS	KNES	KNHC	KPML	KWAL
KWBC	KWNB	LATI	LBSM	LCLK	LDZM	LEMM	LFPW	LFVP	LFVW
LFVX	LGAT	LHBM	LIIB	LJLJ	LJLM	LKCV	LKKB	LKKU	LKKV
LKLN	LKMT	LKMW	LKNA	LKPR	LKPW	LLBD	LLBG	LMMM	LOWM
LOWW	LPAM	LPMG	LQBK	LQSM	LROM	LSSW	LTAA	LTAC	LTBA
LUKK	LWOH	LWSK	LYBM	LYPG	LZIB	LZSO	M-me	MBPV	MDSD
MGGT	MHTG	MJSK	MKJP	MKJS	MMGL	MMMD	MMMX	MMMY	MMMZ
MNMG	MNUB	MPCZ	MPTO	MROC	MSLP	MTPP	MUHA	MWCR	MXBA
MYGF	MYNN	MZBZ	NCRG	NFFN	NFTF	NFTV	NGFU	NGTT	NLWW
NSAP	NSFA	NSTU	NTAA	NVVV	NWBB	NWCC	NWWW	NZCM	NZKL
NZSP	O-hk	OAKB	OBBI	OEJD	OIII	OJAM	OKBK	OKOH	OKPR
OLBA	OMAA	OMAE	OMAM	OOMS	OPKC	OPMT	OPNH	OPPS	OPSK
OPST	ORBI	ORSU	OSDI	OTBD	OTHH	PABR	PADQ	PAKN	PANC
PANT	PAOM	PAOT	PASN	PAYA	PGTW	PGUM	PHEB	PHFO	PHTO
PKMR	PTKK	PTKR	PTSA	PTTP	PTYA	RJGG	RJOO	RJTD	RKSI
RKSL	RPLL	RPMM	RQST	RUAA	RUEK	RUHB	RUIR	RUKR	RUMA
RUMG	RUML	RUMS	RUNW	RUOM	RURD	RUSM	SABE	SABM	SACO
SADF	SAEZ	SAME	SARE	SARI	SASA	SAVC	SAWB	SAWE	SAWG
SAWH	SAZM	SAZN	SAZR	SAZS	SBAO	SBAR	SBAZ	SBBE	SBBG

SBBR	SBBS	SBBV	SBCB	SBCF	SBCG	SBCJ	SBCR	SBCT	SBCW
SBCY	SBEG	SBFI	SBFL	SBFN	SBFZ	SBGL	SBGO	SBGR	SBJP
SBKP	SBLO	SBMA	SBMN	SBMO	SBMQ	SBOI	SBPA	SBPB	SBPK
SBPL	SBPP	SBPV	SBRB	SBRE	SBRF	SBRP	SBSG	SBSJ	SBSL
SBSN	SBSP	SBSV	SBTE	SBTF	SBTT	SBVT	SCCI	SCEF	SCEL
SCSC	SCTE	SEGU	SEQU	SGAS	SKBO	SKCL	SLLP	SMJP	SOCA
SOWR	SPIM	SUMU	SUSO	SVBM	SVMC	SVMG	SVMI	SVVA	SYCJ
SYEC	TAPA	TBPB	TDPD	TD_2	TFFF	TFFR	TGPY	TKPK	TLPC
TLPL	TNCA	TNCC	TNCM	TQPF	TTPP	TXKF	UAFF	UAST	UBBB
UGEE	UGGG	UGTB	UKBW	UKDW	UKLW	UKMS	UKOW	UMMN	UMMS
UMRR	UTAA	UTDD	UTTW	UUUJ	VAAH	VAAK	VAAU	VABB	VABO
VABP	VABV	VAGO	VAID	VAJJ	VANP	VANR	VAOZ	VAPO	VAPR
VARK	VASD	VASL	VASU	VAUD	VBRR	VCBI	VCCC	VCRI	VDPP
VEAT	VEBI	VEBN	VEBS	VECC	VEDG	VEGG	VEGK	VEGT	VEGY
VEIM	VEJH	VEJS	VELP	VELR	VEMN	VEMR	VEPT	VEPY	VERC
VERP	VGDC	VGEG	VGHS	VHHH	VIAR	VIBR	VICH	VIDD	VIDN
VIDP	VIHS	VIJP	VILK	VISM	VISR	VLIV	VMMC	VNKT	VNNN
VOAM	VOAT	VOBG	VOBL	VOBM	VOBZ	VOCB	VOCC	VOCI	VOCL
VOCP	VOGO	VOHB	VOHS	VOHY	VOJV	VOKL	VOKN	VOMD	VOML
VOMM	VOMP	VOMY	VOND	VOPB	VOPC	VORY	VOSM	VOTK	VOTP
VOTR	VOTV	VOVZ	VQPR	VRMM	VTBB	VVGL	VYMD	WA-g	WAAA
WABB	WADL	WAJJ	WAKK	WALL	WAMM	WAOO	WAPP	WAQQ	WARR
WATT	WBSB	WIBB	WIDD	WIDN	WIEE	WIII	WIIX	WIOO	WIPP
WMKK	WSAP	WSSL	WSSS	YBBN	YPRF	YRBK	ZATI	ZBBB	ZHHH
ZJHK	ZKPY	ZMUB	ZSJN	ZSSS					

**Table 3: List of GTS Headers (T<sub>1</sub>T<sub>2</sub>A<sub>1</sub>A<sub>2</sub>) received at NCMRWF (as in November 2019)**

AAAP	AABM	AACL	AAGW	AAHQ	AAIN	AAKO	AASZ	AAWF	ABIO
ABNT	ABPW	ABPZ	ACPN	AOCI	ASCO	ASPS	ASSB	ASUS	ASXX
ATIS	AWIO	AXIN	AXPZ	AXXX	A HM	A IU	BDDR	BIN0	BMDA
BMRR	CSZB	CUNV	DEMS	FAAJ	FABU	FABX	FACR	FACZ	FADN
FAGG	FAHU	FALT	FAOS	FAPL	FAQB	FASN	FASP	FASQ	FAUK
FAUR	FAZM	FBEU	FBIN	FBLJ	FBOS	FBSQ	FBSW	FCAJ	FCAL
FCAP	FCAU	FCBC	FCBX	FCBY	FCDL	FCDN	FCEO	FCFA	FCFI
FCFR	FCGG	FCGI	FCGL	FCGR	FCHU	FCIE	FCIL	FCIN	FCIR
FCIY	FCKY	FCKZ	FCLJ	FCLT	FCNL	FCNM	FCNO	FCOS	FCPL
FCPO	FCRA	FCRE	FCRM	FCRO	FCRS	FCSN	FCSP	FCSQ	FCSV
FCSW	FCTA	FCTS	FCTU	FCUK	FCUR	FCUZ	FCZA	FEBQ	FEE0
FELV	FEOS	FEUK	FGHU	FGYG	FJIN	FKPQ	FKPS	FLIN	FOUK
FPBD	FPBM	FPCZ	FPDL	FPEO	FPHK	FPIN	FPIS	FPLK	FPLV
FPNC	FPOS	FPSR	FPUK	FQAU	FQBQ	FQDN	FQEN	FQFI	FQFJ
FQFW	FQIN	FQIO	FQKN	FQLT	FQLV	FQNT	FQPF	FQPL	FQPS
FQQT	FQSN	FSMU	FTAB	FTAE	FTAG	FAH	FTAI	FTAJ	FTAL
FTAM	FTAN	FTAO	FTAP	FTAR	FTAT	FTAU	FTAY	FTBA	FTBC
FTBE	FTBH	FTBJ	FTBN	FTBO	FTBR	FTBU	FTBW	FTBX	FTBY
FTBZ	FTCA	FTCD	FTCG	FTCH	FTCI	FTCM	FTCN	FTCO	FTCR
FTCS	FTCU	FTCV	FTCY	FTCZ	FTDC	FTDJ	FTDL	FTDN	FTDR
FTEA	FTEG	FTEO	FTEQ	FTER	FTES	FTEU	FTFI	FTFJ	FTFK
FTFP	FTFR	FTGD	FTGG	FTGL	FTGN	FTGO	FTGR	FTGW	FTGY
FTHA	FTHK	FTHO	FTHU	FTHV	FTHW	FTIC	FTID	FTIE	FTIL
FTIN	FTIO	FTIQ	FTIR	FTIS	FTIV	FTIY	FTJD	FTJM	FTJP
FTKB	FTKO	FTKR	FTKW	FTKY	FTKZ	FTLB	FTLC	FTLJ	FTLT
FTLV	FTLY	FTMA	FTMC	FTMF	FTMG	FTMI	FTMJ	FTMO	FTMP
FTMR	FTMS	FTMV	FTMX	FTMZ	FTNC	FTNG	FTNK	FTNL	FTNM
FTNO	FTNP	FTNV	FTNZ	FTOM	FTOS	FTPA	FTPF	FTPH	FTPK
FTPL	FTPM	FTPO	FTPQ	FTPR	FTPS	FTPY	FTQB	FTQT	FTRA
FTRE	FTRH	FTRM	FTRO	FTRS	FTSA	FTSB	FTSC	FTSD	FTSG
FTSM	FTSN	FTSP	FTSQ	FTSR	FTSU	FTSW	FTSY	FTTH	FTTM
FTTR	FTTS	FTTU	FTTV	FTUG	FTUK	FTUR	FTUS	FTUY	FTUZ
FTVN	FTXX	FTYG	FTZA	FTZB	FTZR	FVAG	FVAU	FVFE	FVXX
FXCI	FXIN	FXIO	FXOS	FXPN	FXPQ	FXXT	FXXX	GTGA	GTHA
HESB	HESC	HESD	HESE	HESF	HESG	HESH	HESI	HESJ	HESK
HESM	HESO	HESQ	HETA	HETB	HETC	HETD	HETF	HETG	HETH
HETI	HETJ	HETK	HETM	HETO	HETQ	HEUA	HEUB	HEUC	HEUD
HEUE	HEUF	HEUG	HEUH	HEUI	HEUJ	HEUK	HEUM	HEUO	HEUQ
HEVA	HEVB	HEVC	HEVD	HEVE	HEVG	HEVH	HEVI	HEVJ	HEVM
HEVO	HEVQ	HEWA	HEWB	HEWC	HEWD	HEWE	HEWF	HEWG	HEWH
HEWI	HEWJ	HEWK	HEWM	HEWO	HEWQ	HEXA	HEXB	HEXC	HEXD
HEXE	HEXF	HEXG	HEXH	HEXI	HEXK	HEXM	HEXO	HEXQ	HHCA
HHCC	HHCE	HHCG	HHCI	HHCK	HHCM	HHCO	HHCQ	HHCS	HHCX
HHKE	HHLE	HHSA	HHSB	HHSC	HHSD	HHSE	HHSF	HHSG	HHSH
HHSI	HHSJ	HHSK	HHSM	HHSO	HHSQ	HHTA	HHTB	HHTC	HHTD
HHTE	HHTF	HHTG	HHTH	HHTI	HHTJ	HHTK	HHTM	HHTO	HHTQ
HHUA	HHUB	HHUC	HHUD	HHUE	HHUF	HHUG	HHUH	HHUI	HHUJ
HHUK	HHUM	HHUO	HHUQ	HHVA	HHVB	HHVC	HHVD	HHVE	HHVF
HHVG	HHVH	HHVI	HHVJ	HHVK	HHVM	HHVO	HHVQ	HHWA	HHWB
HHWC	HHWD	HHWE	HHWF	HHWG	HHWH	HHWI	HHWJ	HHWK	HHWM
HHWO	HHWQ	HHXA	HHXB	HHXC	HHXD	HHXE	HHXF	HHXG	HHXH
HHXI	HHXJ	HHXK	HHXM	HHXO	HHXQ	HJSA	HJSB	HJSC	HJSD
HJSE	HJSF	HJSG	HJSH	HJSI	HJSJ	HJSK	HJSM	HJSO	HJTB
HJTC	HJTD	HJTE	HJTF	HJTG	HJTH	HJTI	HJTJ	HJTK	HJTM
HJTO	HJUA	HJUB	HJUC	HJUE	HJUF	HJUG	HJUH	HJUI	HJUJ

HJUK	HJUO	HJVA	HJVB	HJVC	HJVD	HJVE	HJVF	HJVG	HJVI
HJVJ	HJVK	HJVM	HJVO	HJWA	HJWB	HJWC	HJWD	HJWE	HJWG
HJWH	HJWI	HJWJ	HJWK	HJWM	HJWO	HJXA	HJXC	HJXD	HJXE
HJXF	HJXG	HJXH	HJXI	HJXJ	HJXK	HJXM	HJXO	HKSA	HKSB
HKSC	HKSD	HKSE	HKSG	HKSH	HKSI	HKSJ	HKSK	HKSM	HKSO
HKTA	HKTC	HKTD	HKTE	HKTF	HKTG	HKTH	HKTI	HKTJ	HKTK
HKTM	HKTO	HKUA	HKUB	HKUC	HKUD	HKUE	HKUF	HKUG	HKUH
HKUI	HKUJ	HKUK	HKUM	HKUO	HKVA	HKVB	HKVC	HKVD	HKVE
HKVF	HKVG	HKVH	HKVJ	HKVK	HKVM	HKVO	HKWA	HKWB	HKWC
HKWD	HKWE	HKWF	HKWG	HKWH	HKWI	HKWJ	HKWK	HKWM	HKWO
HKXA	HKXB	HKXC	HKXD	HKXE	HKXF	HKXG	HKXH	HKXI	HKXJ
HKXK	HKXM	HKXO	HLSA	HLSB	HLSD	HLSE	HLSF	HLSG	HLSH
HLSI	HLSJ	HLSM	HLSO	HLTA	HLTB	HLTC	HLTD	HLTE	HLTF
HLTG	HLTH	HLTI	HLTJ	HLTK	HLTM	HLTO	HLUA	HLUB	HLUC
HLUD	HLUF	HLUG	HLUH	HLUI	HLUJ	HLUK	HLUM	HLUO	HLVB
HLVC	HLVD	HLVE	HLVF	HLVG	HLVH	HLVI	HLVJ	HLVK	HLVM
HLVO	HLWA	HLWB	HLWC	HLWE	HLWF	HLWG	HLWH	HLWI	HLWJ
HLWK	HLWM	HLWO	HLXA	HLXB	HLXC	HLXD	HLXE	HLXF	HLXG
HLXI	HLXJ	HLXK	HLXM	HLXO	HMSA	HMSB	HMSC	HMSD	HMSF
HMSG	HMSH	HMSI	HMSJ	HMSK	HMSM	HMSO	HMTA	HMTB	HMTC
HMTD	HMTE	HMTF	HMTG	HMTH	HMTJ	HMTK	HMTM	HMTO	HMUA
HMUB	HMUC	HMUD	HMUE	HMUF	HMUH	HMUI	HMUJ	HMUK	HMUM
HMUO	HMVA	HMVB	HMVC	HMVD	HMVE	HMVF	HMVG	HMVH	HMVI
HMVJ	HMVK	HMVM	HMVO	HMWA	HMWB	HMWC	HMWD	HMWE	HMWF
HMWG	HMWH	HMWI	HMWJ	HMWK	HMWM	HMWO	HMXA	HMXB	HMXC
HMXD	HMXE	HMXF	HMXG	HMXH	HMXI	HMXJ	HMXK	HMXM	HMXO
HNSA	HNSB	HNSC	HNSD	HNSE	HNSF	HNSG	HNSH	HNSI	HNSJ
HNSK	HNSM	HNSO	HNTA	HNTB	HNTC	HNTD	HNTE	HNTF	HNTG
HNTH	HNTI	HNTJ	HNTK	HNTO	HNUA	HNUB	HNUC	HNUD	HNUE
HNUF	HNUG	HNUH	HNUI	HNUJ	HNUK	HNUM	HNUO	HNVA	HNVB
HNVC	HNVD	HNVE	HNVF	HNVG	HNVH	HNVI	HNVJ	HNVK	HNVM
HNVO	HNWA	HNWC	HNWD	HNWE	HNWF	HNWG	HNWH	HNWI	HNWK
HNWM	HNWO	HNXA	HNXB	HNXC	HNXD	HNXE	HNXF	HNXG	HNXH
HNXI	HNXJ	HNXK	HNXM	HOCA	HOCB	HOCC	HOCD	HOCE	HOCF
HO CG	HOCH	HO CI	HO CJ	HO CK	HO CL	HO CY	HO CZ	HO CA	HO CB
HPCC	HPCD	HPCE	HPCF	HPCG	HPCH	HPCI	HPCJ	HPCK	HPCM
HPCO	HPCQ	HPCR	HPCS	HPCX	HPCY	HPCZ	HPSA	HPSB	HPSC
HPSD	HPSE	HPSF	HPSG	HPSH	HPSI	HPSJ	HPSK	HPSM	HPSO
HPSQ	HPTA	HPTB	HPTC	HPTD	HPT E	HPT F	HPT G	HPT H	HPT I
HPTJ	HPTK	HPTM	HPTO	HPTQ	HPUA	HPUB	HPUC	HPUD	HPUE
HPUF	HPUG	HPUH	HPUI	HPUJ	HPUK	HPUM	HPUO	HPUQ	HPVA
HPVB	HPVC	HPVD	HPVE	HPVF	HPVG	HPVH	HPVI	HPVJ	HPVK
HPVM	HPVO	HPVQ	HPWA	HPWB	HPWC	HPWD	HPWE	HPWF	HPWG
HPWH	HPWI	HPWJ	HPWK	HPWM	HPWO	HPWQ	HPXA	HPXB	HPXC
HPXD	HPXE	HPXF	HPXG	HPXH	HPXI	HPXJ	HPXK	HPXM	HPXO
HPXQ	HQSA	HQSB	HQSC	HQSD	HQSE	HQSF	HQSG	HQSH	HQSI
HQSJ	HQSK	HQSM	HQSO	HQTA	HQTB	HQTC	HQTD	HQTE	HQTF
HQTG	HQTH	HQTI	HQTJ	HQTK	HQTM	HQTO	HQUA	HQUB	HQUC
HQUD	HQUE	HQUF	HQUG	HQUH	HQUI	HQUJ	HQUK	HQUM	HQUO
HQVA	HQVB	HQVC	HQVD	HQVE	HQVF	HQVG	HQVH	HQVI	HQVJ
HQVK	HQVM	HQVO	HQWA	HQWB	HQWC	HQWD	HQWE	HQWF	HQWG
HQWH	HQWI	HQWJ	HQWK	HQWM	HQWO	HQXA	HQXB	HQXC	HQXD
HQXE	HQXF	HQXG	HQXH	HQXI	HQXJ	HQXK	HQXM	HQXO	HRKE
HRSA	HRSB	HRSC	HRSD	HRSE	HRSF	HRSG	HRSH	HRSI	HRSJ
HRSK	HRSM	HRSO	HRSQ	HRTA	HRTB	HRTC	HRTD	HRTE	HRTF
HRTG	HRTH	HRTI	HRTJ	HRTK	HRTM	HRTO	HRTQ	HRUA	HRUB
HRUC	HRUD	HRUE	HRUF	HRUG	HRUH	HRUI	HRUJ	HRUK	HRUM
HRUO	HRUQ	HRVA	HRVB	HRVC	HRVD	HRVE	HRVF	HRVG	HRVH
HRVI	HRVJ	HRVK	HRVM	HRVO	HRVQ	HRWA	HRWB	HRWC	HRWD

HRWE	HRWF	HRWG	HRWH	HRWI	HRWJ	HRWK	HRWM	HRWO	HRWQ
HRXA	HRXB	HRXC	HRXD	HRXE	HRXF	HRXG	HRXH	HRXI	HRXJ
HRXK	HRXM	HRXO	HRXQ	HTCA	HTCB	HTCC	HTCD	HTCE	HTCF
HTCG	HTCH	HTCI	HTCJ	HTCK	HTCM	HTCO	HTCQ	HTCS	HTCX
HTCY	HTCZ	HTSA	HTSB	HTSC	HTSD	HTSE	HTSF	HTSG	HTSH
HTSI	HTSJ	HTSK	HTSM	HTSO	HTSQ	HTTA	HTTB	HTTC	HTTD
HTTE	HTTF	HTTG	HTTH	HTTI	HTTJ	HTTK	HTTM	HTTO	HTTQ
HTUA	HTUB	HTUC	HTUD	HTUE	HTUF	HTUG	HTUH	HTUI	HTUJ
HTUK	HTUM	HTUO	HTUQ	HTVA	HTVB	HTVC	HTVD	HTVE	HTVF
HTVG	HTVH	HTVI	HTVJ	HTVK	HTVM	HTVO	HTVQ	HTWA	HTWB
HTWC	HTWD	HTWE	HTWF	HTWG	HTWH	HTWI	HTWJ	HTWK	HTWM
HTWO	HTWQ	HTXA	HTXB	HTXC	HTXD	HTXE	HTXF	HTXG	HTXH
HTXI	HTXJ	HTXK	HTXM	HTXO	HTXQ	HTZF	HUCA	HUCB	HUCC
HUCD	HUCE	HUCF	HUCG	HUCH	HUCI	HUCJ	HUCK	HUCM	HUCO
HUCQ	HUCR	HUCS	HUCX	HUCY	HUCZ	HUSA	HUSB	HUSC	HUSD
HUSE	HUSF	HUSG	HUSH	HUSI	HUSJ	HUSK	HUSM	HUSO	HUSQ
HUTA	HUTB	HUTC	HUTD	HUTE	HUTF	HUTG	HUTH	HUTI	HUTJ
HUTK	HUTM	HUTO	HUTQ	HUUA	HUUB	HUUC	HUUD	HUUE	HUUF
HUGG	HUHH	HUUI	HUUJ	HUUK	HUUM	HUOO	HUUQ	HUVA	HUVB
HUVC	HUVD	HUVE	HUVF	HUVG	HUVH	HUVI	HUVJ	HUVK	HUVM
HUVO	HUVQ	HUWA	HUWB	HUWC	HUWD	HUWE	HUWF	HUWG	HUWH
HUWI	HUWJ	HUWK	HUWM	HUWO	HUWQ	HUXA	HUXB	HUXC	HUXD
HUXE	HUXF	HUXG	HUXH	HUXI	HUXJ	HUXK	HUXM	HUXO	HUXQ
HVCA	HVCB	HVCC	HVCD	HVCE	HVCF	HVCG	HVCH	HVCI	HVCJ
HVCK	HVCM	HVCO	HVCQ	HVCS	HVCX	HVCY	HVCZ	HVSA	HVSB
HVSC	HVSD	HVSE	HVSF	HVSG	HVSH	HVSI	HVSJ	HVSK	HVSM
HVSO	HVSQ	HVTA	HVTB	HVTC	HVTD	HVTE	HVTF	HVTG	HVTH
HVTI	HVTJ	HVTK	HVTM	HVTO	HVTQ	HVUA	HVUB	HVUC	HVUD
HVUE	HVUF	HVUG	HVUH	HVUI	HVUJ	HVUK	HVUM	HVUO	HVUQ
HVVA	HVVB	HVVC	HVVD	HVVE	HVVF	HVVG	HVVH	HVVI	HVVJ
HVVK	HVVM	HVVO	HVVQ	HVWA	HVWB	HVWC	HVWD	HVWE	HVWF
HVWG	HVWH	HVWI	HVWJ	HVWK	HVWM	HVWO	HVWQ	HVXA	HVXB
HVXC	HVXD	HVXE	HVXF	HVXG	HVXH	HVXI	HVXJ	HVXK	HVXM
HVXO	HVXQ	HXCA	HXCB	HXCC	HXCD	HXCE	HXCF	HXCG	HXCH
HXCI	HXCJ	HXCK	HXCY	HXCZ	INIX	INKX	IOBA	IOBB	IOBC
IOBD	IOBF	IOBG	IOBX	IOPB	IOPC	IOPI	IOPJ	IOPK	IOPL
IOPX	IOSC	IOSS	IOWA	IPXM	ISAA	ISAB	ISAI	ISAN	ISAS
ISAX	ISCD	ISIA	ISIB	ISIC	ISID	ISIE	ISIF	ISIG	ISIH
ISII	ISIJ	ISIK	ISIL	ISIN	ISIS	ISIX	ISMA	ISMB	ISMC
ISMD	ISME	ISMF	ISMG	ISMH	ISMI	ISMJ	ISMK	ISML	ISMN
ISMS	ISMX	ISNA	ISNC	ISND	ISNE	ISNF	ISNG	ISNH	ISNI
ISNJ	ISNK	ISNL	ISNN	ISNS	ISSA	ISSB	ISSC	ISSD	ISSE
ISSF	ISSG	ISSH	ISSI	ISSJ	ISSK	ISSL	ISSN	ISSS	ISST
ISSX	ISWE	ISXC	ISXD	ISXS	ISXT	ISXX	ISZX	IUAA	IUAB
IUAC	IUAD	IUAE	IUAF	IUAG	IUAH	IUAI	IUAK	IUAL	IUAS
IUAX	IUCA	IUCC	IUCD	IUCE	IUCH	IUCI	IUCL	IUCN	IUCX
IUDA	IUDD	IUJA	IUJB	IUJC	IUJD	IUJG	IUJS	IUKA	IUKB
IUKC	IUKD	IUKE	IUKF	IUKG	IUKI	IUKK	IUKL	IUKN	IUKS
IUKX	IUPA	IUPC	IUPD	IUPK	IUPN	IUQD	IURA	IURD	IURE
IURH	IURI	IURL	IURX	IUSA	IUSB	IUSC	IUSD	IUSE	IUSF
IUSG	IUSH	IUSI	IUSJ	IUSK	IUSL	IUSN	IUSS	IUSX	IUTA
IUTB	IUTC	IUTD	IUTE	IUTF	IUTG	IUTH	IUTI	IUTJ	IUTK
IUTL	IUWA	IUWB	IUWC	IUWG	IUWK	IUWS	IUXA	IUXB	IUXC
IUXD	IUXI	IUXJ	IUXK	IUXL	IXCN	IXCS	IXRA	IXRC	IXRD
IXRE	IXRG	IXRH	IXRI	IXRK	IXRL	IXVA	IXVC	IXVD	IXVE
IXVG	IXVH	IXVI	IXVK	IXVL	JSXX	JUBE	JUCE	JUFE	JUJE
JUME	JUNE	JUOE	JUTE	JUVE	JUWE	KSAA	KSAB	KSAC	KSAE
KSAF	KSAG	KSAJ	KSIH	KSII	KSME	KSMH	KSMI	KSMX	KSXD
KULC	KULD	KULI	KULL	MMIN	NCNC	NOCN	NOIN	NOUK	NOXX

NWXX	NXFR	RRIN	SAAB	SAAE	SAAF	SAAG	SAAH	SAAJ	SAAK
SAAL	SAAM	SAAO	SAAP	SAAR	SAAS	SAAT	SAAU	SAAY	SABA
SABC	SABE	SABH	SABM	SABN	SABO	SABR	SABU	SABW	SABX
SABY	SABZ	SACA	SACG	SACH	SACI	SACN	SACO	SACR	SACS
SACU	SACV	SACY	SACZ	SADC	SADJ	SADL	SADN	SADO	SADR
SAEA	SAEG	SAEO	SAEQ	SAER	SAES	SAET	SAEU	SAFA	SAFG
SAFI	SAFJ	SAFK	SAFP	SAFR	SAGC	SAGD	SAGG	SAGI	SAGL
SAGN	SAGR	SAGU	SAGY	SAHA	SAHK	SAHO	SAHU	SAHW	SAID
SAIE	SAIL	SAIN	SAIO	SAIQ	SAIR	SAIS	SAIY	SAJD	SAJM
SAJP	SAKN	SAKO	SAKR	SAKU	SAKW	SAKY	SAKZ	SALB	SALC
SALI	SALJ	SALT	SALV	SALY	SAMA	SAMC	SAME	SAMF	SAMG
SAMI	SAMJ	SAMO	SAMP	SAMR	SAMS	SAMT	SAMV	SAMX	SANC
SANG	SANK	SANL	SANM	SANO	SANP	SANV	SANZ	SAOM	SAOS
SAPA	SAPH	SAPK	SAPL	SAPM	SAPO	SAPR	SAPS	SAPY	SAQB
SARA	SARE	SARH	SARM	SARO	SARS	SARW	SASA	SASB	SASC
SASD	SASG	SASI	SASM	SASN	SASP	SASQ	SASR	SASU	SASV
SASW	SASY	SATA	SATD	SATH	SATN	SATR	SATS	SATU	SAUK
SAUR	SAUS	SAUY	SAUZ	SAVN	SAXX	SAYG	SAZA	SAZM	SAZR
SAZS	SDAJ	SDPH	SDTH	SEXX	SIAA	SIAB	SIAG	SIAJ	SIAL
SIAN	SIAR	SIAT	SIAU	SIBC	SIBD	SIBJ	SIBM	SIBO	SIBU
SICA	SICD	SICG	SICH	SICI	SICM	SICN	SICO	SICR	SICS
SICU	SICV	SICZ	SIDN	SIDR	SIEG	SIEO	SIEQ	SIER	SIET
SIFA	SIFG	SIFI	SIFJ	SIFW	SIGB	SIGE	SIGG	SIGH	SIGL
SIGN	SIGO	SIGQ	SIGR	SIGW	SIHK	SIID	SIIN	SIIQ	SIIR
SIIV	SIY	SIJD	SIJP	SIKB	SIKN	SIKO	SIKR	SIKU	SIKW
SIKY	SIKZ	SILA	SILB	SILC	SILS	SILT	SILY	SIMA	SIMC
SIMD	SIMF	SIMG	SIMI	SIMJ	SIMK	SIML	SIMR	SIMS	SIMU
SIMV	SIMX	SIMZ	SINC	SING	SINI	SINM	SINO	SINR	SINU
SINV	SINZ	SIOM	SIPF	SIPH	SIPK	SIPL	SIPS	SIQB	SIQT
SIRA	SIRE	SIRH	SIRM	SIRO	SIRS	SIRW	SISB	SISC	SISD
SISE	SISG	SISN	SISO	SISQ	SISR	SISV	SISY	SITA	SITH
SITN	SITO	SITR	SITS	SITU	SITV	SIUG	SIUS	SIUZ	SIVA
SIVB	SIVC	SIVD	SIVE	SIVF	SIVJ	SIVS	SIVX	SIXX	SIYG
SIZA	SIZR	SMAA	SMAB	SMAG	SMAJ	SMAK	SMAL	SMAN	SMAR
SMAT	SMAU	SMAY	SMAZ	SMBA	SMBC	SMBD	SMBE	SMBH	SMBJ
SMBM	SMBN	SMBO	SMBT	SMBU	SMBW	SMBX	SMBY	SMBZ	SMCA
SMCD	SMCE	SMCG	SMCH	SMCI	SMCM	SMCN	SMCO	SMCR	SMCS
SMCU	SMCV	SMCZ	SMDJ	SMDN	SMDO	SMDR	SMEG	SMEO	SMEQ
SMER	SMET	SMFA	SMFG	SMFI	SMFJ	SMFP	SMFR	SMFW	SMGB
SMGC	SMGD	SMGE	SMGG	SMGH	SMGL	SMGN	SMGO	SMGR	SMGW
SMGY	SMHK	SMHO	SMHV	SMID	SMIL	SMIN	SMIQ	SMIR	SMIV
SMIY	SMJD	SMJM	SMJP	SMKA	SMKB	SMKN	SMKO	SMKP	SMKR
SMKU	SMKW	SMKY	SMKZ	SMLA	SMLB	SMLC	SMLS	SMLT	SMLY
SMMA	SMMC	SMMD	SMME	SMMF	SMMG	SMMH	SMMI	SMMJ	SMMK
SMML	SMMN	SMMO	SMMR	SMMS	SMMU	SMMV	SMMW	SMMX	SMMZ
SMNC	SMNG	SMNI	SMNL	SMNM	SMNO	SMNR	SMNU	SMNV	SMNZ
SMOM	SMPA	SMPF	SMPH	SMPK	SMPL	SMPO	SMPR	SMPS	SMPY
SMQB	SMQT	SMRA	SMRE	SMRH	SMRM	SMRO	SMRS	SMRW	SMSB
SMSC	SMSD	SMSE	SMSG	SMSI	SMSM	SMSN	SMSO	SMSQ	SMSR
SMSV	SMSY	SMTA	SMTD	SMTG	SMTH	SMTN	SMTO	SMTR	SMTS
SMTU	SMTV	SMUG	SMUR	SMUS	SMUY	SMUZ	SMVA	SMVB	SMVC
SMVD	SMVE	SMVF	SMVG	SMVI	SMVJ	SMVS	SMVX	SMXX	SMYG
SMZA	SMZB	SMZM	SMZR	SMZS	SNAA	SNAG	SNAL	SNAU	SNAZ
SNBX	SNCA	SNCN	SNDN	SNEO	SNFI	SNFP	SNFR	SNGL	SNHK
SNIN	SNIY	SNMD	SNMK	SNNG	SNNO	SNPH	SNPL	SNPS	SNQB
SNQT	SNRE	SNRH	SNRO	SNSN	SNSP	SNSQ	SNTU	SNVA	SNVB
SNVC	SNVD	SNVE	SNVF	SNVJ	SNVX	SOAT	SOBH	SOBR	SOHO
SOJM	SOLC	SONU	SONV	SOPM	SOVD	SOVE	SOVI	SOVX	SPAE
SPAG	SPAU	SPBN	SPBO	SPBU	SPBY	SPBZ	SPCN	SPCO	SPCZ



SPDN	SPDR	SPEO	SPIL	SPIN	SPIS	SPIY	SPJD	SPKO	SPLT
SPMC	SPMW	SPMX	SPNR	SPOS	SPPR	SPSA	SPSP	SPSQ	SPSR
SPUR	SPUS	SPZA	SRBU	SRHU	SRIQ	SRRH	SRSQ	SRYG	SSVD
SSVF	SSVX	SSWB	STAC	STSN	SUCZ	SWIN	SWIO	SWWE	SXHK
SXHW	SXIN	SXOM	SXPK	SXPL	SXUK	SXXT	SXXX	SZAU	SZCI
SZIO	SZNZ	SZOC	SZPA	SZPS	TBUS	TCIN	TWNA	TWSA	UAAA
UAAE	UAAK	UAAS	UAAU	UABZ	UACH	UACN	UADL	UAEU	UAEW
UAFE	UAFJ	UAFR	UAHW	UAIE	UAIN	UAIO	UAIY	UAJP	UALT
UANO	UANT	UAPA	UAPF	UAPS	UARA	UARO	UARS	UASQ	UAST
UASW	UAUK	UAUR	UAUS	UAXN	UAXX	UDAA	UDAF	UDAS	UDBZ
UDNA	UDOC	UDPN	UDPS	UEAA	UEAG	UEAI	UEAJ	UEAK	UEAL
UEAU	UEBA	UEBD	UEBE	UEBU	UEBW	UEBY	UEBZ	UECA	UECE
UECG	UECH	UECI	UECM	UECN	UECR	UECZ	UEDL	UEEG	UEER
UEFA	UEFJ	UEGL	UEGO	UEGR	UEHE	UEHK	UEHU	UEID	UEIE
UEIL	UEIN	UEIR	UEIS	UEIV	UEIY	UEJD	UEJP	UEKK	UEKO
UEKZ	UELJ	UEMC	UEMD	UEMG	UEMI	UEMK	UEMS	UEMX	UENR
UENV	UENZ	UEOM	UEPA	UEPF	UEPH	UEPL	UEPM	UEPO	UERA
UERH	UERO	UERS	UESA	UESB	UESC	UESD	UESG	UESN	UESP
UESQ	UESR	UEST	UETS	UETU	UEUK	UEUR	UEUS	UEVS	UEZA
UFKA	UGAG	UGAH	UGAK	UGAU	UGBA	UGBD	UGBJ	UGBU	UGBZ
UGCB	UGCG	UGCI	UGCM	UGCN	UGCO	UGDR	UGEG	UGFJ	UGGO
UGHK	UGHV	UGID	UGIN	UGIS	UGIV	UGMA	UGMG	UGMI	UGMS
UGNF	UGNR	UGNV	UGNZ	UGPH	UGPK	UGPM	UGRO	UGSB	UGSG
UGSI	UGSR	UGTG	UGTH	UGTS	UGZA	UGZN	UHBD	UHBU	UHBW
UHBZ	UHCG	UHCI	UHCM	UHEG	UHFJ	UHHK	UHID	UHIN	UHS
UHIV	UHMA	UHMS	UHNH	UHNV	UHPH	UHRO	UHSB	UHSR	UHTH
UHZA	UKAA	UKAG	UKAI	UKAJ	UKAK	UKAL	UKAU	UKBA	UKBD
UKBU	UKBW	UKBY	UKBZ	UKCA	UKCE	UKCG	UKCH	UKCI	UKCM
UKCN	UKCR	UKCZ	UKDL	UKDR	UKEG	UKER	UKFA	UKFJ	UKGL
UKGO	UKGR	UKHE	UKHK	UKHU	UKID	UKIE	UKIL	UKIN	UKIR
UKIS	UKIY	UKJD	UKJP	UKKK	UKKO	UKKZ	UKLJ	UKMD	UKMG
UKMI	UKMK	UKMS	UKMX	UKNR	UKNV	UKNZ	UKOM	UKPA	UKPF
UKPH	UKPK	UKPL	UKPM	UKPO	UKPY	UKRA	UKRH	UKRO	UKRS
UKSA	UKSB	UKSC	UKSD	UKSG	UKSN	UKSP	UKSQ	UKSR	UKST
UKSZ	UKTR	UKTS	UKTU	UKUK	UKUR	UKUS	UKVS	UKYG	UKZA
UKZN	UKZR	ULAA	ULAG	ULAI	ULAJ	ULAK	ULAL	ULAU	ULBA
ULBD	ULBE	ULBU	ULBW	ULBX	ULBY	ULBZ	ULCA	ULCE	ULCH
ULCI	ULCM	ULCN	ULCO	ULCR	ULCZ	ULDL	ULDR	ULEG	ULER
ULFJ	ULGL	ULGO	ULGR	ULHE	ULHK	ULHU	ULID	ULIE	ULIL
ULIN	ULIS	ULIV	ULIY	ULJD	ULJP	ULKK	ULKO	ULKZ	ULLJ
ULMD	ULMG	ULMI	ULMK	ULMS	ULMX	ULNR	ULNV	ULNZ	ULOM
ULPA	ULPF	ULPH	ULPL	ULPM	ULPO	ULRA	ULRH	ULRO	ULRS
ULSA	ULSB	ULSC	ULSD	ULSG	ULSN	ULSP	ULSQ	ULSR	ULST
ULTS	ULTU	ULUK	ULUR	ULUS	ULVS	ULYG	ULZA	ULZN	UPAG
UPAH	UPBD	UPBJ	UPBU	UPBW	UPBZ	UPCB	UPCG	UPCI	UPCM
UPCR	UPEG	UPEZ	UPFJ	UPGO	UPHK	UPID	UPIN	UPIS	UPIV
UPMA	UPMG	UPMI	UPMS	UPNR	UPNV	UPNZ	UPPH	UPPK	UPRO
UPSB	UPSG	UPSI	UPSR	UPTG	UPTH	UPTS	UPZA	UPZN	UPZR
UQBA	UQBD	UQBU	UQBZ	UQCB	UQCN	UQCO	UQCR	UQDR	UQEZ
UQFJ	UQHK	UQHV	UQID	UQIN	UQIS	UQMO	UQMS	UQNV	UQNZ
UQPH	UQPM	UQRO	UQSB	UQSI	UQSR	UQTH	UQZA	UQZN	USAA
USAG	USAH	USAI	USAJ	USAK	USAL	USAU	USBA	USBD	USBE
USBH	USBU	USBW	USBY	USBZ	USCA	USCE	USCG	USCH	USCI
USCM	USCN	USCO	USCR	USCZ	USDL	USDN	USEG	USER	USFA
USFJ	USGL	USGO	USGR	USHE	USHK	USHU	USID	USIE	USIL
USIN	USIR	USIS	USIV	USIY	USJD	USJP	USKK	USKN	USKO
USKZ	USLJ	USMC	USMD	USMG	USMI	USMK	USMO	USMS	USMX
USNO	USNR	USNV	USNZ	USOM	USPA	USPF	USPH	USPK	USPL
USPM	USPO	USPR	USRA	USRH	USRO	USRS	USSA	USSB	USSC

USSD	USSG	USSN	USSP	USSQ	USSR	USST	USSZ	USTR	USTS
USTU	USUG	USUK	USUR	USUS	USVS	USYG	USZA	USZN	UXIN
VABB	VABJ	VABP	VAGO	VANP	VEAT	VEBS	VEMN	VEVZ	VICH
VIDP	VIJP	VILK	VISR	VMEQ	VMLV	VOHY	VOKL	VOMM	VOMP
VOVZ	WAAB	WABZ	WAEG	WAGG	WAIY	WAKO	WANO	WAPL	WARH
WATS	WATU	WAYG	WAZA	WCFJ	WCNT	WOAU	WOCN	WODL	WOFI
WOIN	WOMQ	WOMS	WOMU	WOSR	WSAG	WSAU	WSAZ	WSBN	WSBO
WSBY	WSBZ	WSCA	WSCG	WSCH	WSCI	WSCN	WSCO	WSEQ	WSET
WSFG	WSFJ	WSFR	WSGL	WSGR	WSGY	WSID	WSIR	WSIY	WSKW
WSMG	WSMJ	WSMP	WSMS	WSMX	WSNM	WSNO	WSNT	WSNZ	WSPA
WSPF	WSPH	WSPL	WSPN	WSPR	WSPS	WSPY	WSRA	WSRS	WSSB
WSSC	WSSD	WSSG	WSSO	WSSP	WSSR	WSTU	WSUR	WSUS	WSUY
WSVN	WSVS	WSZA	WSZR	WTIN	WTNC	WTNT	WTPN	WTPQ	WTPS
WVAG	WVCH	WVEQ	WVGR	WVID	WVJP	WVMX	WVPR	WWAA	WWCI
WWCN	WWHK	WWIN	WWPK	WWXX	W au	W cn	W nz	Z C	

**Table 4: List of Datasets that are being received through GTS and their T1T2 codes**

<b>Data type</b>	<b>T1T2 Code</b>
<i>Alphanumeric data</i>	
Surface	SA, SI, SM,SN,SO,SS
Upper air	UA,UD,UE,UH,UK,UL,UP,UQ,US,UX
Tropical Cyclone bulletins	TC,TW
Satellite TBUS	TB
<i>Binary data</i>	
BUFR	IN,IO,IP,IS,IU,IX
GRIB	H? (model forecasts from UKMO,JMA etc.)
CREX data	J

**Table 5: List of implemented Conventional Decoders along with corresponding T1T2 codes**

<b>Sl. No.</b>	<b>Decoder</b>	<b>T<sub>1</sub>T<sub>2</sub>/ T<sub>1</sub>T<sub>2</sub>A<sub>1</sub></b>
1	Lsfc (Synop/Land Surface)	SI,SM,SN
2	msfc (Marine surface)	SI,SM,SN
3	drbu, (Drifting buoy)	SO
4	bthy (Ocean Sub-surface)	SS
5	Metr (metars)	SA
6	Synp (Bufrsynop)	IS
7	buoy (bufr buoy and Ocean)	IO
8	Acft (Aircraft)	UA
9	Unsnd (Dropsonde)	UD
10	Usnd (RSRW, Pilot balloon)	U[E-I],U[K-M],U[P-Q],US,UX
11	Bufraobs	IU[J-K],IU[S-T],IUW, IUD
12	amdr (bufr Aircraft)	IUA
13	elrw (AMV)	IUC,IUX
14	Profilers [Prflr, jpfl, epfl]	IUP
15	rocc [Radio Occultations)	IUT
16	Scat [Ascatt]	ISX

## Annexure-I

### DATA DESIGNATORS T<sub>1</sub>T<sub>2</sub>A<sub>1</sub>A<sub>2</sub>ii IN ABBREVIATED HEADINGS

Table A	:	Data type designator T <sub>1</sub> Matrix Table for T <sub>2</sub> A <sub>1</sub> A <sub>2</sub> ii definitions
Table B1	:	Data type designator T <sub>2</sub> (when T <sub>1</sub> = A, C, F, N, S, T, U or W)
Table B2	:	Data type designator T <sub>2</sub> when T <sub>1</sub> = D, G, H, X or Y)
Table B3	:	Data type designator T <sub>2</sub> (when T <sub>1</sub> = I or J)
Table B4	:	Data type designator T <sub>2</sub> (when T <sub>1</sub> = O)
Table B5	:	Data type designator T <sub>2</sub> (when T <sub>1</sub> = E)
Table B6	:	Data type designator T <sub>2</sub> (when T <sub>1</sub> =P,Q)
Table B7	:	Data type designator T <sub>2</sub> (when T <sub>1</sub> = L)
Table C1	:	Geographical designators A <sub>1</sub> A <sub>2</sub> for use in abbreviated headings T <sub>1</sub> T <sub>2</sub> A <sub>1</sub> A <sub>2</sub> ii CCCC YYGGgg for bulletins containing meteorological information, excluding ships' weather reports and oceanographic data
Table C2	:	Geographical designators A <sub>1</sub> A <sub>2</sub> for use in abbreviated headings T <sub>1</sub> T <sub>2</sub> A <sub>1</sub> A <sub>2</sub> ii CCCC YYGGgg for bulletins containing ships' weather reports and oceanographic data including reports from automatic marine stations
Table C3	:	Geographical area designator A <sub>1</sub> (when T <sub>1</sub> = D, G, H, O, P, Q, T, X or Y) and geographical area designator A <sub>2</sub> (when T <sub>1</sub> = I or J)
Table C4	:	Reference time designator A <sub>2</sub> (when T <sub>1</sub> = D, G, H, J, O, P or T)
Table C5	:	Reference time designator A <sub>2</sub> (when T <sub>1</sub> = Q, X or Y)
Table C6	:	Data type designator A <sub>1</sub> (when T <sub>1</sub> = I or J)
Table C7	:	Data type designator T <sub>2</sub> and A <sub>1</sub> (when T <sub>1</sub> = K)
Table D1	:	Level designator ii (when T <sub>1</sub> = O)
Table D2	:	Level designator ii (when T <sub>1</sub> = D, G, H, J, P, Q, X or Y)
Table D3	:	Level designator ii (when T <sub>1</sub> T <sub>2</sub> = FA or UA)

**Table A: Data type designator T<sub>1</sub> Matrix Table for T<sub>2</sub>A<sub>1</sub>A<sub>2</sub>ii definitions**

T <sub>1</sub>	Data type	T <sub>2</sub>	A <sub>1</sub>	A <sub>2</sub>	ii	Priority
A	Analyses	B1	C1	C1	**	3
B	Addressed message	***	***	***	***	1/2/4*
C	Climatic data	B1	C1	C1	**	4
D	Grid point information (GRID)	B2	C3	C4	D2	3
E	Satellite imagery	B5	C1	C1	**	3
F	Forecasts	B1	C1	C1	**	3
G	Grid point information (GRID)	B2	C3	C4	D2	3
H	Grid point information (GRIB)	B2	C3	C4	D2	3
I	Observational data (Binary coded) – BUFR	B3	C6	C3	**	2
J	Forecast information (Binary coded) – BUFR	B3	C6	C4	D2	3
K	CREX	B3	C7	C3	**	2
L	Aviation information in XML	B7	C1	C1	**	1/2/3
M	–					
N	Notices	B1	C1	C1	**	4
O	Oceanographic information (GRIB)	B4	C3	C4	D1	3
P	Pictorial information (Binary coded)	B6	C3	C4	D2	3
Q	Pictorial information regional (Binary coded)	B6	C3	C5	D2	3
R	–					
S	Surface data	B1	C1/C2	C1/C2	**	2/4*
T	Satellite data	B1	C3	C4	**	2
U	Upper-air data	B1	C1/C2	C1/C2	**	2
V	National data	(1)	C1	C1	**	(2)
W	Warnings	B1	C1	C1	**	1

X	Common Alert Protocol (CAP) messages					
Y	GRIB regional use	B2	C3	C5	D2	3
Z	–					

\* Priority level: 1 is allocated to service messages.

2 is allocated to data and request messages.

3 is allocated to seismic waveform data (T<sub>1</sub>T<sub>2</sub> = SY).

4 is allocated to administrative messages.

\*\* See paragraph 2.3.2.2 for definition and use.

\*\*\* See paragraph 2.4.2 for definition and use.

(1) Table B2 or national table.

(2) To be determined.

Note: CLIMAT TEMP is not recommended for operations. See the *Abridged Final Report with Resolutions and Recommendations of the 2010 Extraordinary Session of the Commission for Basic Systems* (WMO-No. 1070).

**Table B1: Data type designator T<sub>2</sub> (when T<sub>1</sub> = A, C, F, N, S, T, U or W) Instructions**

*for the proper application of the data type designators*

1. The designators specified in this table should be used to the greatest extent possible to indicate the type of data contained within the body of the bulletin.

2. When the tables does not contain a suitable designator for the data type, an alphabetic designator which is not assigned in the table should be introduced and the WMO Secretariat notified.

3. This table includes only the FM number and code name for an individual code form. The Roman numeral identifying the latest version has been omitted to reduce clutter. In all cases the latest version of a code is implied. Refer to the *Manual on Codes* (WMO-No. 306) for the complete code name (including the version) of any numbered code. In those few instances where a numbered code does not exist, a reference and the common name is given: e.g. [ICAO] (AIREP). An explanatory note may be appended to an individual table if necessary.

4. In the event that no standard format has been established for a particular data type, and where there is a recommended format, that format is given in square brackets under the column labelled Code form (e.g. [TEXT]). This is a character code in free form – International Alphabet No. 2 (Attachment II-1) or International Alphabet No. 5 (Attachment II-2) will be used.

T <sub>1</sub> = A Analyses			
T <sub>2</sub> Designator	Data type	Code form	(name)
C	Cyclone	[TEXT]	
G	Hydrological/marine	[TEXT]	
H	Thickness	[TEXT]	
I	Ice	FM 44	(ICEAN)
O	Ozone layer	[TEXT]	
R	Radar	[TEXT]	
S	Surface	FM 45	(IAC)/FM 46 (IAC FLEET)
U	Upper air	FM 45	(IAC)
W	Weather summary	[TEXT]	
X	Miscellaneous	[TEXT]	

T <sub>1</sub> = C Climatic data		
<i>I</i> <sub>2</sub>	<i>Data type</i>	<i>Code form (name)</i>
<i>Designator</i>		
A	Climatic anomalies	[TEXT]
E	Monthly means (upper air)	FM 76 (SHIP)
H	Monthly means (surface)	FM 72 (CLIMAT SHIP)
O	Monthly means (ocean areas)	FM 73 (NACLI, CLINP, SPCLI, CLISA, INCLI)
S	Monthly means (surface)	FM 71 (CLIMAT)

T <sub>1</sub> = F Forecasts		
<i>T</i> <sub>2</sub>	<i>Data type</i>	<i>Code form (name)</i>
<i>Designator</i>		
A	Aviation area/GAMET/advisories	FM 53 (ARFOR)/[TEXT]
B	Upper winds and temperatures	FM 50 (WINTEM)
C	Aerodrome (VT < 12 hours)	FM 51 (TAF)
D	Radiological trajectory dose	FM 57 (RADOF)
E	Extended	[TEXT]
F	Shipping	FM 46 (IAC FLEET)
G	Hydrological	FM 68 (HYFOR)
H	Upper-air thickness	[TEXT]
I	Iceberg	[TEXT]
J	Radio warning service (including IUWDS data)	[TEXT]
K	Tropical cyclone advisories	[TEXT]
L	Local/area	[TEXT]
M	Temperature extremes	[TEXT]
O	Guidance	[TEXT]
P	Public	[TEXT]
Q	Other shipping	[TEXT]
R	Aviation route	FM 54 (ROFOR)
S	Surface	FM 45 (IAC)/FM 46 (IAC FLEET)
T	Aerodrome (VT ≥ 12 hours)	FM 51 (TAF)
U	Upper air	FM 45 (IAC)
V	Volcanic ash advisories	[TEXT]
W	Winter sports	[TEXT]
X	Miscellaneous	[TEXT]
Z	Shipping area	FM 61 (MAFOR)

T <sub>1</sub> = N Notices		
<i>T</i> <sub>2</sub>	<i>Data type</i>	<i>Code form (name)</i>
<i>Designator</i>		
G	Hydrological	[TEXT]
H	Marine	[TEXT]
N	Nuclear emergency response	[TEXT]
O	METNO/WIFMA	[TEXT]
P	Product generation delay	[TEXT]
T	TEST MSG [System related]	[TEXT]
W	Warning related and/or cancellation	[TEXT]

T <sub>1</sub> = S Surface data		
<i>I</i> <sub>2</sub>	<i>Data type</i>	<i>Code form (name)</i>
<i>Designator</i>		
A	Aviation routine reports	FM 15 (METAR)
B	Radar reports (Part A)	FM 20 (RADOB)
C	Radar reports (Part B)	FM 20 (RADOB)
D	Radar reports (Parts A & B)	FM 20 (RADOB)
E	Seismic data	* (SEISMIC)
F	Atmospherics reports	FM 81 (SFAZI)/FM 82 (SFLOC)/FM 83 (SFAZU)
G	Radiological data report	FM 22 (RADREP)
H	Reports from DCP stations	(any format)
I	Intermediate synoptic hour	FM 12 (SYNOP)/FM 13 (SHIP)
L	–	–
M	Main synoptic hour	FM 12 (SYNOP)/FM 13 (SHIP)
N	Non-standard synoptic hour	FM 12 (SYNOP)/FM 13 (SHIP)
O	Oceanographic data	FM 63 (BATHY)/FM 64 (TESAC)/ FM 62 (TRACKOB)
P	Special aviation weather reports	FM 16 (SPECI)
R	Hydrological (river) reports	FM 67 (HYDRA)
S	Drifting buoy reports	FM 18 (DRIFTER)
T	Sea ice	[TEXT]
U	Snow depth	[TEXT]
V	Lake ice	[TEXT]
W	Wave information	FM 65 (WAVEOB)
X	Miscellaneous	[TEXT]
Y	Seismic waveform data	(any format)
Z	Sea-level data and deep-ocean tsunami data	(any alphanumeric format)

\* The international seismic code is documented in the *Manual on Codes* (WMO-No. 306), Volume I.1, Attachment III.

T <sub>1</sub> = T Satellite data		
<i>T</i> <sub>2</sub>	<i>Data type</i>	<i>Code form (name)</i>
<i>Designator</i>		
B	Satellite orbit parameters	[TEXT]
C	Satellite cloud interpretations	FM 85 (SAREP)
H	Satellite remote upper-air soundings	FM 86 (SATEM)
R	Clear radiance observations	FM 87 (SARAD)
T	Sea surface temperatures	FM 88 (SATOB)
W	Winds and cloud temperatures	FM 88 (SATOB)
X	Miscellaneous	[TEXT]

$T_2$ Designator	T <sub>1</sub> = U Upper-air data Data type	Code form (name)
A	Aircraft reports	FM 41 (CODAR), ICAO (AIREP)
D	Aircraft reports	FM 42 (AMDAR)
E	Upper-level pressure, temperature, humidity and wind (Part D)	FM 35 (TEMP)/FM 36 (TEMP SHIP)/ FM 38 (TEMP MOBIL)
F	Upper-level pressure, temperature, humidity and wind (Parts C and D) [National and bilateral option]	FM 35 (TEMP)/FM 36 (TEMP SHIP)/ FM 38 (TEMP MOBIL)
G	Upper wind (Part B)	FM 32 (PILOT)/FM 33 (PILOT SHIP)/ FM 34 (TEMP MOBIL)
H	Upper wind (Part C)	FM 32 (PILOT)/FM 33 (PILOT SHIP)/ FM 34 (TEMP MOBIL)
I	Upper wind (Parts A and B) [National and bilateral option]	FM 32 (PILOT)/FM 33 (PILOT SHIP)/ FM 34 (TEMP MOBIL)
K	Upper-level pressure, temperature, humidity and wind (Part B)	FM 35 (TEMP)/FM 36 (TEMP SHIP)/ FM 38 (TEMP MOBIL)
L	Upper-level pressure, temperature, humidity and wind (Part C)	FM 35 (TEMP)/FM 36 (TEMP SHIP)/ FM 38 (TEMP MOBIL)
M	Upper-level pressure, temperature, humidity and wind (Parts A and B) [National and bilateral option]	FM 35 (TEMP)/FM 36 (TEMP SHIP)/ FM 38 (TEMP MOBIL)
N	Rocketsonde reports	FM 39 (ROCOB)/FM 40 (ROCOB SHIP)
P	Upper wind (Part A)	FM 32 (PILOT)/FM 33 (PILOT SHIP)/ FM 34 (PILOT MOBIL)
Q	Upper wind (Part D)	FM 32 (PILOT)/FM 33 (PILOT SHIP)/ FM 34 (PILOT MOBIL)
R	Aircraft report	[NATIONAL*] (RECCO)
S	Upper-level pressure, temperature, humidity and wind (Part A)	FM 35 (TEMP)/FM 36 (PILOT SHIP)/ FM 38 (TEMP MOBIL)
T	Aircraft report	FM 41 (CODAR)
X	Miscellaneous	[TEXT]
Y	Upper wind (Parts C and D) [National and bilateral option]	FM 32 (PILOT)/FM 33 (PILOT SHIP)/ FM 34 (PILOT MOBIL)
Z	Upper-level pressure, temperature, humidity and wind from a sonde released by carrier balloon or aircraft (Parts A, B, C, D)	FM 37 (TEMP DROP)

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\* For example, United States national code form for reports from a meteorological reconnaissance flight (RECCO), is documented in the *Manual on Codes* (WMO-No. 306), Volume II, Chapter IV, Part E.



<i>I</i> <sub>2</sub> Designator	<i>T</i> <sub>1</sub> = W Warnings Data type	Code form (name)
A	AIRMET	[TEXT]
C	Tropical cyclone (SIGMET)	[TEXT]
E	Tsunami	[TEXT]
F	Tornado	[TEXT]
G	Hydrological/river flood	[TEXT]
H	Marine/coastal flood	[TEXT]
O	Other	[TEXT]
R	Humanitarian activities	(any format)
S	SIGMET	[TEXT]
T	Tropical cyclone (Typhoon/hurricane)	[TEXT]
U	Severe thunderstorm	[TEXT]
V	Volcanic ash clouds (SIGMET)	[TEXT]
W	Warnings and weather summary	[TEXT]

**Table B2: Data type designator T<sub>2</sub> (when T<sub>1</sub> = D, G, H or Y)**

*Instructions for the proper application of the data type designators*

1. The designator specified in this table should be used to the greatest extent possible to indicate the type of data contained within the text of the bulletin.
2. Where more than one type is contained in the text, the designator for one of the data types should be used.
3. When the table does not contain a suitable designator for the data type, an alphabetic designator which is not assigned in the table should be introduced and the WMO Secretariat notified.

<i>Designator</i>	<i>Data type</i>	<i>Designator</i>	<i>Data type</i>
A	Radar data	N	Radiation
B	Cloud	O	Vertical velocity
C	Vorticity	P	Pressure
D	Thickness (relative topography)	Q	Wet bulb potential temperature
E	Precipitation	R	Relative humidity
G	Divergence	T	Temperature
H	Height	U	Eastward wind component
J	Wave height + combinations	V	Northward wind component
K	Swell height + combinations	W	Wind
M	For national use	Z	Not assigned

**Table B3: Data type designator T2 (when T1 = I or J)**

*Instructions for the proper application of the data type designators*

1. The designators specified in this table should be used to the greatest extent possible to indicate the type of data contained within the body of the BUFR bulletin.
2. Where more than one data type is contained in the bulletin, the designators for only one of the data types should be used.
3. When the table does not contain a suitable designator for the data type, an alphabetic designator which is not assigned in the table should be introduced and the WMO secretariat notified.

<i>Designator</i>	<i>Data type</i>
N	Satellite data
O	Oceanographic/limnographic (water property)
S	Surface/sea level
T	Text (plain language information)
U	Upper-air data
X	Other data types

**Table B4: Data type designator T2 (when T1 = O)**

*Instructions for the proper application of the data type designators*

1. The designators specified in this table should be used to the greatest extent possible to indicate the type of data contained within the body of the GRIB bulletin for oceanographic products.
2. Where more than one data type is contained in the bulletin, the designators for only one of the data types should be used.
3. When the table does not contain a suitable designator for the data type, an alphabetic designator which is not assigned in the table should be introduced and the WMO secretariat notified.

<i>Designator</i>	<i>Data type</i>
D	Depth
E	Ice concentration
F	Ice thickness
G	Ice drift
H	Ice growth
I	Ice convergence/divergence
Q	Temperature anomaly
R	Depth anomaly
S	Salinity
T	Temperature
U	Current component
V	Current component
W	Temperature warming
X	Mixed data

**Table B5: Data type designator T2 (when T1 = E)**

<i>Designator</i>	<i>Data type</i>	<i>Designator</i>	<i>Data type</i>
C	Cloud top temperature	V	Visible
F	Fog	W	Water vapour
I	Infrared	Y	User specified
S	Surface temperature	Z	Unspecified

**Table B6: Data type designator T2 (when T1 = P, Q)**

*Instructions for the proper application of the data type designators*

1. The designator specified in this table should be used to the greatest extent possible to indicate the type of data contained within the text of the bulletin.
2. Where more than one type is contained in the text, the designator for one of the data types should be used.
3. When the table does not contain a suitable designator for the data type, an alphabetic designator which is not assigned in the table should be introduced and the WMO Secretariat notified.

<i>Designator</i>	<i>Data type</i>	<i>Designator</i>	<i>Data type</i>
A	Radar data	N	Radiation
B	Cloud	O	Vertical velocity
C	Clear air turbulence	P	Pressure
D	Thickness (relative topography)	Q	Wet bulb potential temperature
E	Precipitation	R	Relative humidity
F	Aerological diagrams (Ash cloud)	S	Snow cover
G	Significant weather	T	Temperature
H	Height	U	Eastward wind component
I	Ice flow	V	Northward wind component
J	Wave height + combinations	W	Wind
K	Swell height + combinations	X	Lifted index
L	Plain language	Y	Observational plotted chart
M	For national use	Z	Not assigned

**Table B7: Data type designator T2 (when T1 = L)**

<i>Designator</i>	<i>Data type</i>	<i>GTS priority</i>	<i>Code form name</i>
A	Aviation routine reports ("METAR")	2	
C	Aerodrome Forecast ("TAF") (VT < 12 hours)	3	
K	Tropical cyclone advisories	3	
P	Special aviation weather reports ("SPECI")	2	
S	Aviation general warning ("SIGMET")	1	
T	Aerodrome forecast ("TAF") (VT ≥ 12 hours)	3	
U	Volcanic ash advisory	3	
V	Aviation volcanic ash warning ("SIGMET")	1	
W	AIRMET	1	
Y	Aviation tropical cyclone warning ("SIGMET")	1	

Note: Data that are expressed in extensible markup language (XML) and use data designators of T1 = L and T2 = A, C, K, P, S, T, U, V, W and Y are using IWXXM (FM-205).

**Table C1: Geographical designators A<sub>1</sub>A<sub>2</sub> for use in abbreviated headings T<sub>1</sub>T<sub>2</sub>A<sub>1</sub>A<sub>2</sub>ii CCCC YYGGgg for bulletins containing meteorological information, excluding ships' weather reports and oceanographic data**

*Instructions for the proper application of the geographical designators*

1. This table is subdivided into two parts: Part I contains geographical designators related to countries or territories in each RTH zone of responsibility for the collection of observational reports (surface and upper-air); Part II contains those for vast areas such as continents, hemispheres, etc.
2. In the case of bulletins containing observational reports (surface and upper-air) from land stations, geographical designators contained in Part II of the table should be used only when no suitable designators are available in Part I of the table.
3. In the case of bulletins containing meteorological information related to aircraft reports, analyses, prognoses, warnings, climatological data, satellite data and also analogue facsimile information, all the geographical designators contained in this table can be used. However, as far as possible, the geographical designator XX should not be used.
4. For the geographical designator in the abbreviated heading of the METNO and WIFMA messages, XX should be used.
5. Geographical designators contained in this table should not be used in the abbreviated heading of bulletins containing ships' weather reports and oceanographic data.

Notes:

1. The designations employed and the presentation of the material in this table do not imply the expression of any opinion whatsoever on the part of the World Meteorological Organization concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.
2. For T<sub>1</sub>T<sub>2</sub> = SZ, A<sub>1</sub>A<sub>2</sub> area designator from Table C1 should be used.

**Part I – Country or territory designators**

<i>A<sub>1</sub>A<sub>2</sub> Country</i>	<i>A<sub>1</sub>A<sub>2</sub> Country</i>
AB Albania	BH Belize
AG Argentina	BI Burundi
AH Afghanistan	BJ Benin
AI Ascension Island	BK Banks Islands
AJ Azerbaijan	BM Myanmar
AK Alaska	BN Bahrain
AL Algeria	BO Bolivia (Plurinational State of)
AN Angola	BR Barbados
AT Antigua and Barbuda, Saint Kitts and Nevis, and other British islands in the vicinity	BT Bhutan
AU Australia	BU Bulgaria
AY Armenia	BV Bouvet Island
AZ Azores	BW Bangladesh
	BX Belgium, Luxembourg
BA Bahamas	BY Belarus
BC Botswana	BZ Brazil
BD Brunei Darussalam	
BE Bermuda	

<i>A1A2 Country</i>	<i>A1A2 Country</i>
CD Chad	GQ Equatorial Guinea
CE Central African Republic	GR Greece
CG Congo	GU Guatemala
CH Chile	GW Guinea-Bissau
CI China	GY Guyana
CM Cameroon	
CN Canada	HA Haiti
CO Colombia	HE Saint Helena
CR Canary Islands (Spain)	HK Hong Kong, China
CS Costa Rica	HO Honduras
CT Canton Island	HU Hungary
CU Cuba	HV Burkina Faso
CV Cabo Verde	HW Hawaiian Islands
CY Cyprus	
CZ Czechia	IC Comoros
	ID Indonesia
DC Bonaire, St Eustatius and Saba	IE Ireland
DJ Djibouti	IL Iceland
DL Germany	IN India
DN Denmark	IQ Iraq
DO Dominica	IR Islamic Republic of Iran
DR Dominican Republic	IS Israel
	IV Côte d'Ivoire
EG Egypt	IY Italy
EI Eritrea	
EO Estonia	JD Jordan
EQ Ecuador	JM Jamaica
ER United Arab Emirates	JP Japan
ES El Salvador	
ET Ethiopia	KA Caroline Islands
	KB Kiribati
FA Faroe Islands	KI Christmas Island
FG French Guiana	KK Cocos Islands
FI Finland	KN Kenya
FJ Fiji	KO Republic of Korea
FK Falkland Islands (Malvinas)	KP Cambodia
FM Federated States of Micronesia	KR Democratic People's Republic of Korea
FP Saint Pierre and Miquelon	KU Cook Islands
FR France	KW Kuwait
FW Wallis and Futuna	KY Kyrgyzstan
	KZ Kazakhstan
GB Gambia	
GC Cayman Islands	LA Lao People's Democratic Republic
GD Grenada	LB Lebanon
GE Gough Island	LC Saint Lucia
GG Georgia	LI Liberia
GH Ghana	LJ Slovenia
GI Gibraltar	LN Southern Line Islands
GL Greenland	LS Lesotho
GM Guam	LT Lithuania
GN Guinea	LV Latvia
GO Gabon	LY Libya

<i>A1A2</i>	<i>Country</i>	<i>A1A2</i>	<i>Country</i>
MA	Mauritius	PO	Portugal
MB	Marion Island	PP	Palau
MC	Morocco	PR	Peru
MD	Madeira	PT	Pitcairn
MF	Saint-Martin, Saint-Barthélemy, Guadeloupe and other French islands in the vicinity	PU	Puerto Rico
MG	Madagascar	PY	Paraguay
MH	Marshall Islands	QB	Bosnia and Herzegovina
MI	Mali	QT	Qatar
MJ	The former Yugoslav Republic of Macedonia	RA	Russian Federation (East)
MK	Montenegro	RE	Réunion and associated islands
ML	Malta	RH	Croatia
MN	St Maarten	RM	Republic of Moldova
MO	Mongolia	RO	Romania
MR	Martinique	RS	Russian Federation (West)
MS	Malaysia	RW	Rwanda
MT	Mauritania	SB	Sri Lanka
MU	Macao, China	SC	Seychelles
MV	Maldives	SD	Saudi Arabia
MW	Malawi	SG	Senegal
MX	Mexico	SI	Somalia
MY	Mariana Islands	SK	Sarawak
MZ	Mozambique	SL	Sierra Leone
NC	New Caledonia	SM	Suriname
NE	Niue	SN	Sweden
NG	Papua New Guinea	SO	Solomon Islands
NI	Nigeria	SP	Spain
NK	Nicaragua	SQ	Slovakia
NL	Netherlands	SR	Singapore
NM	Namibia	SU	Sudan
NO	Norway	SV	Swaziland
NP	Nepal	SW	Switzerland
NR	Niger	SX	Santa Cruz Islands
NU	Curaçao and Aruba	SY	Syrian Arab Republic
NV	Vanuatu	SZ	Spitzbergen Islands
NW	Nauru	TA	Tajikistan
NZ	New Zealand	TC	Tristan da Cunha
OM	Oman	TD	Trinidad and Tobago
OO	Monaco	TG	Togo
OR	South Orkney Islands	TH	Thailand
OS	Austria	TI	Turks and Caicos Islands
PF	French Polynesia	TK	Tokelau
PH	Philippines	TM	Timor-Leste
PI	Phoenix Islands	TN	United Republic of Tanzania
PK	Pakistan	TO	Tonga
PL	Poland	TP	Sao Tome and Principe
PM	Panama	TR	Turkmenistan
		TS	Tunisia
		TU	Turkey
		TV	Tuvalu

<i>A1A2 Country</i>	<i>A1A2 Country</i>
UG Uganda	YE Yemen
UK United Kingdom of Great Britain and Northern Ireland	YG Serbia
UR Ukraine	
US United States of America	ZA South Africa
UY Uruguay	ZB Zambia
UZ Uzbekistan	ZM Samoa
	ZR Democratic Republic of the Congo
VG Saint Vincent and the Grenadines	ZS South Sudan
VI Virgin Islands	ZW Zimbabwe
VN Venezuela (Bolivarian Republic of)	
VS Vietnam	

## Part II – Area designators

<i>A1A2 Geographical area</i>	<i>A1A2 Geographical area</i>
AA Antarctic	MP Central Mediterranean area
AC Arctic	MQ Western Mediterranean area
AE South-East Asia	
AF Africa	NA North America
AM Central Africa	NT North Atlantic area
AO West Africa	
AP Southern Africa	OC Oceania
AS Asia	OH Sea of Okhotsk
AW Near East	
AX Arabian Sea area	PA Pacific area
	PE Persian Gulf area
BQ Baltic Sea area	PN North Pacific area
	PQ Western North Pacific
CA Caribbean and Central America	PS South Pacific area
	PW Western Pacific area
EA East Africa	PZ Eastern Pacific area
EC East China Sea area	
EE Eastern Europe	SA South America
EM Middle Europe	SE Southern Ocean area
EN Northern Europe	SJ Sea of Japan area
EU Europe	SS South China Sea area
EW Western Europe	ST South Atlantic area
	XE Eastern hemisphere
FE Far East	XN Northern hemisphere
	XS Southern hemisphere
GA Gulf of Alaska area	XT Tropical belt
GX Gulf of Mexico area	XW Western hemisphere
	XX For use when other designators are not appropriate
IO Indian Ocean area	
ME Eastern Mediterranean area	
MM Mediterranean area	

**Table C2: Geographical designators A<sub>1</sub>A<sub>2</sub> for use in abbreviated headings T<sub>1</sub>T<sub>2</sub>A<sub>1</sub>A<sub>2</sub>ii CCCC YYGGgg for bulletins containing ships' weather reports and oceanographic data including reports from automatic marine stations**

*Instructions for the proper application of the geographical designators*

1. The first letter A<sub>1</sub> will denote the nature of the ship or automatic marine station:

For ocean weather stations: W  
 For mobile ships and other marine stations: V  
 For floats (T<sub>1</sub>T<sub>2</sub> = SO): F

2. The second letter A<sub>2</sub> will denote the area from which the reports contained in the bulletins originate.

3. Whenever practicable, separate bulletins should be prepared to avoid the use of the letter X.

Note: For T<sub>1</sub>T<sub>2</sub> = SZ, A<sub>1</sub>A<sub>2</sub> area designators from Table C1 should be used.

<i>Designator</i>	<i>Geographical area</i>
A	Area between 30°N–60°S, 35°W–70°E
B	Area between 90°N–05°N, 70°E–180°E
C	Area between 05°N–60°S, 120°W–35°W
D	Area between 90°N–05°N, 180°W–35°W
E	Area between 05°N–60°S, 70°E–120°W
F	Area between 90°N–30°N, 35°W–70°E
J	Area south of 60°S
X	More than one area

**Table C3: Geographical area designator A<sub>1</sub> (when T<sub>1</sub> = D, G, H, O, P, Q, T, X or Y) and geographical area designator A<sub>2</sub> (when T<sub>1</sub> = I or J)**

*Instructions for the proper application of the geographical area designator*

1. The designator specified in this table should be used to the greatest extent possible to indicate the geographical area of the data contained within the text of the bulletin.
2. Where the geographical area of the data does not correspond exactly with the designator, the designator for the area most approximating that of the data may be used.
3. When the table does not contain a suitable designator for the geographical area, an alphabetic designator which is not assigned in the table should be introduced and the WMO Secretariat notified.

<i>Designator</i>	<i>Geographical area</i>	<i>Designator</i>	<i>Geographical area</i>
A	0° – 90°W northern hemisphere	I	0° – 90°W southern hemisphere
B	90°W – 180° northern hemisphere	J	90°W – 180° southern hemisphere
C	180° – 90°E northern hemisphere	K	180° – 90°E southern hemisphere
D	90°E – 0° northern hemisphere	L	90°E – 0° southern hemisphere
E	0° – 90°W tropical belt	N	Northern hemisphere
F	90°W – 180° tropical belt	S	Southern hemisphere
G	180° – 90°E tropical belt	T	45°W – 180° northern hemisphere
H	90°E – 0° tropical belt	X	Global area (area not definable)



**Table C4: Reference time designator A2 (when T1 = D, G, H, J, O, Por T)***Instructions for the proper application of the reference time designators*

1. The designators specified in this table should be used to the greatest extent possible to indicate the reference time of data contained within the text of the bulletin.
2. Where the table does not contain a suitable designator for the reference time, an alphabetic designator which is not assigned in the table should be used.

<i>Designator</i>	<i>Reference time</i>	<i>Designator</i>	<i>Reference time</i>
A	Analysis (00 hour)	L	84 hours forecast
B	6 hours forecast	M	96 hours forecast
C	12 hours forecast	N	108 hours forecast
D	18 hours forecast	O	120 hours forecast (5 days)
E	24 hours forecast	P	132 hours forecast
F	30 hours forecast	Q	144 hours forecast
G	36 hours forecast	R	156 hours forecast (7 days)
H	42 hours forecast	S	168 hours forecast
I	48 hours forecast	T	10 days forecast
J	60 hours forecast	U	15 days forecast
K	72 hours forecast	V	30 days forecast
		W...Z	Not assigned

**Table C5: Reference time designator A2 (when T1 = Q, X or Y)**

<i>Designator</i>	<i>Reference time</i>	<i>Designator</i>	<i>Reference time</i>
A	Analysis (00 hour)	J	27 hours forecast
B	3 hours forecast	K	30 hours forecast
C	6 hours forecast	L	33 hours forecast
D	9 hours forecast	M	36 hours forecast
E	12 hours forecast	N	39 hours forecast
F	15 hours forecast	O	42 hours forecast
G	18 hours forecast	P	45 hours forecast
H	21 hours forecast	Q	48 hours forecast
I	24 hours forecast		

**Table C6: Data type designator A1 (when T1 = I or J)**

*Instructions for the proper application of the data type designators*

1. The designators specified in this table should be used to the greatest extent possible to indicate the type of data contained within the body of the BUFR bulletin.
2. Where more than one data type is contained in the bulletin, the designators for only one of the data types should be used.
3. When the table does not contain a suitable designator for the data types, an alphabetic designator which is not assigned in the table should be introduced and the WMO Secretariat notified.

<i>T<sub>1</sub>T<sub>2</sub></i>	<i>A<sub>1</sub></i>	<i>ii</i>	<i>Data type</i>	<i>TAC correspondence</i>	<i>Data category subcategory (Common Table C13)</i>
IN	A		Satellite data (AMSUA)		003/003
IN	B		Satellite data (AMSUB)		003/004
IN	C		CrIS (selected channels)		003/030
IN	H		Satellite data (HIRS)		003/005
IN	I		IRAS		003/020
IN	J		HIRAS		003/030
IN	K		MWHS/MWHS-2		003/040
IN	M		Satellite data (MHS)		003/006
IN	Q		IASI (Principle component scores)		003/007
IN	S		ATMS		003/040
IN	T		MWTS/MWTS-2		003/040
IO	B		Buoy observations	BUOY	001/025
IO	I		Sea ice		
IO	P		Sub-surface profiling floats	TESAC	031/004
IO	R		Sea surface observations	TRACKOB	031/001
IO	S		Sea surface and below soundings	BATHY, TESAC	031/005
IO	T		Sea surface temperature		
IO	W		Sea surface waves	WAVEOB	031/002
IO	X		Other sea environmental		
IO	Z		Deep ocean tsunami meter		031/007
IP	C		Radar composite imagery data		
IP	I		Satellite imagery data		
IP	R		Radar imagery data		
IP	X		Not defined		
IS	A	01–29	Routinely scheduled observations for distribution from automatic (fixed or mobile) land stations (e.g. 0000, 0100, ... or 0220, 0240, 0300, ..., or 0715, 0745, ... UTC)	n/a	000/006
IS	A	30–59	N-minute observations from automatic (fixed or mobile) land stations	n/a	000/007
IS	B		Radar reports (parts A and B)	RADOB	006/003
IS	C	01–45	Climatic observations from land stations	CLIMAT	000/020

<i>TiT2</i>	<i>A1</i>	<i>ii</i>	<i>Data type</i>	<i>TAC correspondence</i>	<i>Data category subcategory (Common Table C13)</i>
IS	C	46–59	Climatic observations from marine stations	CLIMAT SHIP	001/020
IS	D		Radiological observation	RADREP	010/001
IS	E		Measurement of surface ozone	n/a	008/000
IS	F		Source of atmospheric	SFAZI, SFLOC, SFAZU	000/030
IS	I	01–45	Intermediate synoptic observations from fixed land stations	SYNOP (SIxx)	000/001 000/051
IS	I	46–59	Intermediate synoptic observations from mobile land stations	SYNOP MOBIL	000/004
IS	M	01–45	Main synoptic observations from fixed land Stations	SYNOP (SMxx)	000/002 000/052
IS	M	46–59	Main synoptic observations from mobile land Stations	SYNOP MOBIL	000/005
IS	N	01–45	Synoptic observations from fixed land stations at non-standard time (i.e. 0100, 0200, 0400, 0500, ... UTC)	SYNOP (SNxx)	000/000 000/050
IS	N	46–59	Synoptic observations from mobile land stations at non-standard time (i.e. 0100, 0200, 0400, 0500, ... UTC)	SYNOP MOBIL	000/003
IS	R		Hydrologic reports	HYDRA	000/040
IS	S	01–19	Synoptic observations from marine stations	SHIP	001/000
IS	S	20–39	One-hour observations from automatic marine Stations	n/a	001/006
IS	S	40–59	N-minute observations from automatic marine Stations	n/a	001/007
IS	T	01–19	Tide gauge observations	n/a	001/030
IS	T	20–39	Observed water level time series	n/a	001/031
IS	V		Special aeronautical observations (SPECI)	SPECI	000/011
IS	W		Aviation routine weather observations (METAR)	METAR	000/010
IS	X		Other surface data	IAC, IAC FLEET	
IT	A		Administrative message		
IT	B		Service message		
IT	R		Request for data (inclusive of type)		
IT	X		Other text messages or information		
IU	A		Single level aircraft reports (automatic)	AMDAR	004/000
IU	A		Single level aircraft reports (manual)	AIREP/PIREP	004/001
IU	B		Single level balloon reports	n/a	
IU	C		(used for single level satellite-derived reports – see Note 3)	SAREP/SATOB	005/000
IU	D		Dropsonde/Dropwindsondes	TEMP DROP	002/007
IU	E		Ozone vertical sounding	n/a	008/001
IU	I		Dispersal and transport analysis	n/a	009/000
IU	J	01–19	Upper wind from fixed land stations (entire sounding)	PILOT (parts A, B, C, D)	002/001

<i>TiT2</i>	<i>A1</i>	<i>ii</i>	<i>Data type</i>	<i>TAC correspondence</i>	<i>Data category subcategory (Common Table C13)</i>
IU	J	20–39	Upper wind from mobile land stations (entire sounding)	PILOT MOBIL (parts A, B, C, D)	002/003
IU	J	40–59	Upper wind from marine stations (entire sounding)	PILOT SHIP (parts A, B, C, D)	002/002
IU	K	01–19	Radio soundings from fixed land stations (up to 100 hPa)	TEMP (parts A, B)	002/004
IU	K	20–39	Radio soundings from mobile land stations (up to 100 hPa)	TEMP MOBIL (parts A, B)	002/006
IU	K	40–59	Radio soundings from marine stations (up to 100 hPa)	TEMP SHIP (parts A, B)	002/005
IU	L		Total ozone		008/002
IU	M		Model derived sondes		
IU	N		Rocket sondes		
IU	O		Profiles of aircraft observations in ascending/descending	AMDAR	002/020
IU	P		Profilers	PILOT	002/010
IU	Q		RASS temperature profilers	TEMP	002/011
IU	R		(used for radiance data – see Note 3)		
IU	S	01–19	Radiosondes/pibal reports from fixed land stations (entire sounding)	TEMP (parts A, B, C, D)	002/004
IU	S	20–39	Radio soundings from mobile land stations (entire sounding)	TEMP MOBIL (parts A, B, C, D)	002/006
IU	S	40–59	Radio soundings from marine stations (entire sounding)	TEMP SHIP (parts A, B, C, D)	002/005
IU	T		(used for satellite-derived sondes – see Note 3)	SATEM, SARAD, SATOB	
IU	U	46–59	Monthly statistics of data from marine stations	SHIP	002/026
IU	W	01–19	Upper wind from fixed land stations (up to 100 hPa)	PILOT (parts A, B)	002/001
IU	W	20–39	Upper wind from mobile land stations (up to 100 hPa)	PILOT MOBIL (parts A, B)	002/003
IU	W	40–59	Upper wind from marine stations (up to 100 hPa)	PILOT SHIP (parts A, B)	002/002
IU	X		Other upper-air reports		
JO	I		Sea ice		
JO	S		Sea surface and below soundings		
JO	T		Sea surface temperature		
JO	W		Sea surface waves		
JO	X		Other sea environmental data		
JS	A		Surface area forecast (e.g. airways)		
JS	D		Radiological forecast	RADOF	
JS	M		Surface forecasts (e.g. MOS)		
JS	O		Maritime forecast	MAFOR	
JS	P		Forecast amendments (airways)		
JS	R		Hydrologic forecast	HYFOR	

<i>T<sub>1</sub>T<sub>2</sub></i>	<i>A<sub>1</sub></i>	<i>ii</i>	<i>Data type</i>	<i>TAC correspondence</i>	<i>Data category subcategory (Common Table C13)</i>
JS	S		Forecast amendments (TAF)		
JS	T		Aerodrome forecast (TAF)		
JS	X		Other surface forecasts		
JT	E		Tsunami		
JT	H		Hurricane, typhoon, tropical storm warning		
JT	S		Severe weather, SIGMET		
JT	T		Tornado warning		
JT	X		Other warnings		
JU	A		Forecast at single levels		
JU	B		Binary coded SIGWX, Embedded Cumulonimbus		
JU	C		Binary coded SIGWX, Clear-air turbulence		
JU	F		Binary coded SIGWX, Fronts		
JU	N		Binary coded SIGWX, Other SIGWX parameters		
JU	O		Binary coded SIGWX, Turbulence		
JU	S		Forecast soundings		
JU	T		Binary coded SIGWX, Icing/Tropopause		
JU	V		Binary coded SIGWX, Tropical storms, sandstorms, volcanoes		
JU	W		Binary coded SIGWX, High-level winds		
JU	X		Other upper-air forecasts		

Notes:

1. Content of ISMx, ISIx, ISNx messages corresponds to the content of traditional SYNOP messages SMxx, Slxx, SNxx.
2. Category/Subcategory = 000/000 identifies SYNOP data from 0100, 0200, 0300, 0400, 0500, 0700, 0800, 1000, 1100, 1300, ... UTC). Thus SNxx in traditional SYNOP corresponds to ISNx in BUFR.
3. Designators A<sub>1</sub> for T<sub>1</sub>T<sub>2</sub> already used for satellite data (e.g. IUC, IUR, IUT) are not allocated and reserved for future allocations, pending the allocation of A<sub>1</sub> for T<sub>1</sub>T<sub>2</sub> = IN (satellite data).

**Table C7: Data type designator T<sub>2</sub> and A<sub>1</sub> (when T<sub>1</sub> = K)**

<i>T<sub>1</sub>T<sub>2</sub></i>	<i>A<sub>1</sub></i>	<i>ii</i>	<i>Data type</i>	<i>TAC correspondence</i>	<i>Data category subcategory (Common Table C13)</i>
KF	A		Surface area forecast (e.g. airways)		
KF	D		Radiological forecast	RADOF	
KF	M		Surface forecasts (e.g. MOS)		
KF	O		Maritime forecast	MAFOR	
KF	P		Forecast amendments (airways)		
KF	R		Hydrologic forecast	HYFOR	
KF	S		Forecast amendments (TAF)		
KF	T		Aerodrome forecast (TAF)		
KF	X		Other surface forecasts		
KO	B		Buoy observations	BUOY	001/025

<i>T<sub>1</sub>T<sub>2</sub></i>	<i>A<sub>1</sub></i>	<i>ii</i>	<i>Data type</i>	<i>TAC correspondence</i>	<i>Data category subcategory (Common Table C13)</i>
KO	I		Sea ice		
KO	P		Sub-surface profiling floats	TESAC	031/004
KO	R		Sea surface observations	TRACKOB	031/001
KO	S		Sea surface and below soundings	BATHY, TESAC	031/005
KO	T		Sea surface temperature		
KO	W		Sea surface waves	WAVEOB	031/002
KO	X		Other sea environmental	WAVEOB	031/002
KP	I		Sea ice		
KP	S		Sea surface and below soundings		
KP	T		Sea surface temperature		
KP	W		Sea surface waves		
KP	X		Other sea environmental		
KS	A	01–29	Routinely scheduled observations for distribution from automatic (fixed or mobile) land stations (e.g. 0000, 0100, ... or 0220, 0240, 0300, ..., or 0715, 0745, ... UTC)	n/a	000/006
KS	A	30–59	N-minute observations from automatic (fixed or mobile) land stations	n/a	000/007
KS	B		Radar reports (parts A and B)	RADOB	006/003
KS	C	01–45	Climatic observations from land stations	CLIMAT	000/020
KS	C	46–59	Climatic observations from marine stations	CLIMAT SHIP	001/020
KS	D		Radiological observation	RADREP	010/001
KS	E		Measurement of surface ozone	n/a	008/000
KS	F		Source of atmospheric	SFAZI, SFLOC, SFAZU	000/030
KS	I	01–45	Intermediate synoptic observations from fixed land stations	SYNOP (SIxx)	000/001 000/051
KS	I	46–59	Intermediate synoptic observations from mobile fixed land stations	SYNOP MOBIL	000/004
KS	M	01–45	Main synoptic observations from fixed land stations	SYNOP (SMxx)	000/002 000/052
KS	M	46–59	Main synoptic observations from mobile land stations	SYNOP MOBIL	000/005
KS	N	01–45	Synoptic observations from fixed land stations at non-standard time (i.e. 0100, 0200, 0400, 0500, ..., UTC)	SYNOP (SNxx)	000/000 000/050
KS	N	46–59	Synoptic observations from mobile land stations at non-standard time (i.e. 0100, 0200, 0400, 0500, 0700, 0800, 1000, 1100, 1300, ... UTC)	SYNOP MOBIL	000/003
KS	R		Hydrologic reports	HYDRA	000/040
KS	S	01–19	Synoptic observations from marine stations	SHIP	001/000
KS	S	20–39	One-hour observations from automatic marine stations	n/a	001/006
KS	S	40–59	N-minute observations from automatic marine stations	n/a	001/007
KS	V		Special aeronautical observations (SPECI)	SPECI	000/011
KS	W		Aviation routine weather observations (METAR)	METAR	000/010
KS	X		Other surface data	IAC, IAC FLEET	

<i>T<sub>1</sub>T<sub>2</sub></i>	<i>A<sub>1</sub> li</i>	<i>Data type</i>	<i>Data category</i>	
			<i>TAC correspondence</i>	<i>subcategory (Common Table C13)</i>
KT	E	Tsunami		
KT	H	Hurricane, typhoon, tropical storm warning		
KT	S	Severe weather, SIGMET		
KT	T	Tornado warning		
KT	X	Other warnings		
KU	A	Single level aircraft reports (automatic)	AMDAR	004/000
KU	A	Single level aircraft reports (manual)	AIREP/PIREP	004/001
KU	B	Single level balloon reports	n/a	
KU	C	Single level satellite-derived reports	SAREP	005/000
KU	D	Dropsonde/dropwindsondes	TEMP DROP	002/007
KU	E	Ozone vertical sounding		008/001
KU	I	Dispersal and transport analysis	n/a	009/000
KU	J	01–19 Upper wind from fixed land stations	PILOT (parts A, B, C and D)	002/001
KU	J	20–39 Upper wind from mobile land stations	PILOT MOBIL (parts A, B, C and D)	002/003
KU	J	40–59 Upper wind from marine stations	PILOT SHIP (parts A, B, C and D)	002/002
KU	K	01–19 Radio soundings from fixed land stations	TEMP (parts A and B)	002/004
KU	K	20–39 Radio soundings from mobile land stations	TEMP MOBIL (parts A and B)	002/006
KU	K	40–59 Radio soundings from marine stations	TEMP SHIP (parts A and B)	002/005
KU	L	Total ozone	n/a	008/002
KU	M	Model derived sondes		
KU	N	Rocket sondes		
KU	O	Profiles of aircraft observations in ascending/Descending	AMDAR	002/020
KU	P	Profilers	PILOT	002/010
KU	Q	RASS temperature profilers	TEMP	002/011
KU	S	01–19 Radiosondes/pibal reports from fixed land Stations	TEMP (parts A, B, C and D)	002/004
KU	S	20–39 Radio soundings from mobile land stations	TEMP MOBIL (parts A, B, C and D)	002/006
KU	S	40–59 Radio soundings from marine stations	TEMP SHIP (parts A, B, C and D)	002/005
KU	T	Satellite derived sondes		
KU	U	46–59 Monthly statistics of data from marine stations	SHIP	002/026
KU	W	01–19 Upper wind from fixed land stations	PILOT (parts A and B)	002/001
KU	W	20–39 Upper wind from mobile land stations	PILOT MOBIL (parts A and B)	002/003
KU	W	40–59 Upper wind from marine stations	PILOT SHIP	002/002
KU	X	Other upper-air reports	(parts A and B)	

<i>T<sub>1</sub>T<sub>2</sub></i>	<i>A<sub>1</sub></i>	<i>ii</i>	<i>Data type</i>	<i>TAC correspondence</i>	<i>Data category subcategory (Common Table C13)</i>
KV	A		Forecast at single levels		
KV	B		Coded SIGWX, Embedded Cumulonimbus		
KV	C		CREX coded SIGWX, Clear air turbulence		
KV	F		CREX coded SIGWX, Fronts		
KV	N		CREX coded SIGWX, Other SIGWX parameters		
KV	O		CREX coded SIGWX, Turbulence		
KV	s		Forecast soundings		
KV	T		CREX coded SIGWX, Icing/Tropopause		
KV	V		CREX coded SIGWX, Tropical storms, sandstorms, volcanoes		
KV	W		CREX coded SIGWX, High-level winds		
KV	X		Other upper-air forecasts		

Note: T<sub>1</sub>T<sub>2</sub> = SZ is allocated to sea-level data and deep-ocean tsunami data in any alphanumerical form including CREX.

**Table D1: Level designator ii (when T<sub>1</sub> = O)**

*Instructions for the proper application of level designators for ocean depths*

The designators specified in this table should be used to the greatest extent possible to indicate the levels below the ocean surface in the body of the GRIB bulletin for oceanographic products.

<i>Designator</i>	<i>Depth (in metres)</i>	<i>Designator</i>	<i>Depth (in metres)</i>
98	Surface	62	500
96	2.5	60	600
94	5.0	58	700
92	7.5	56	800
90	12.5	54	900
88	17.5	52	1 000
86	25.0	50	1 100
84	32.5	48	1 200
82	40.0	46	1 300
80	50.0	44	1 400
78	62.5	42	1 500
76	75.0	40	1 750
74	100	38	2 000
72	125	36	2 500
70	150	34	3 000
68	200	32	4 000
66	300	30	5 000
64	400	01	Primary layer depth



**Table D2: Level designator ii (when T<sub>1</sub> = D, G, H, J, P, Q, X or Y)***Instructions for the proper application of level designators*

1. The designator specified in this table should be used to the greatest extent possible to indicate the level of the data contained within the text of the bulletin.
2. When data at more than one level are contained in the text, the designator for only one of the levels should be used.
3. When the table does not contain a suitable designator for the level, a designator which is not assigned in the table should be used.

<i>Designator</i>	<i>Level</i>	<i>Designator</i>	<i>Level</i>
99	1000 hPa	65	650 hPa
98	Air properties for the Earth's surface	64	640 hPa
97	Level of the tropopause	63	630 hPa
96	Level of maximum wind	62	625 hPa
95	950 hPa	61	610 hPa
94	Level of 0°C isotherm	60	600 hPa
93	975 hPa	59	590 hPa
92	925 hPa	58	580 hPa
91	875 hPa	57	570 hPa
90	900 hPa	56	560 hPa
89	Any parameter reduced to sea level (e.g. MSLP)	55	550 hPa
88	Ground or water properties for the Earth's surface (i.e. snow cover, wave and swell)	54	540 hPa
87	1000–500 hPa thickness	53	530 hPa
86	Boundary level	52	520 hPa
85	850 hPa	51	510 hPa
84	840 hPa	50	500 hPa
83	830 hPa	49	490 hPa
82	825 hPa	48	480 hPa
81	810 hPa	47	470 hPa
80	800 hPa	46	460 hPa
79	790 hPa	45	450 hPa
78	780 hPa	44	440 hPa
77	775 hPa	43	430 hPa
76	760 hPa	42	420 hPa
75	750 hPa	41	410 hPa
74	740 hPa	40	400 hPa
73	730 hPa	39	390 hPa
72	725 hPa	38	380 hPa
71	710 hPa	37	370 hPa
70	700 hPa	36	360 hPa
69	690 hPa	35	350 hPa
68	680 hPa	34	340 hPa
67	675 hPa	33	330 hPa
66	660 hPa	32	320 hPa
		31	310 hPa
		30	300 hPa

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<i>Designator</i>	<i>Level</i>
24	240 hPa
23	230 hPa
22	220 hPa
21	210 hPa
20	200 hPa
19	190 hPa
18	180 hPa
17	170 hPa
16	160 hPa
15	150 hPa
14	140 hPa
13	130 hPa
12	120 hPa

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<i>Designator</i>	<i>Level</i>
11	110 hPa
10	100 hPa
09	090 hPa
08	080 hPa
07	070 hPa
06	060 hPa
05	050 hPa
04	040 hPa
03	030 hPa
02	020 hPa
01	010 hPa
0	Entire atmosphere (e.g. precipitable water)

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**Table D3: Level designator ii (when T1T2 = FA or UA)**

<i>T1T2</i>	<i>Designator ii</i>	<i>Data type</i>	<i>Code form (name)</i>
FA	01–49	Aviation area/advisories	FM 53 (ARFOR) [text]
FA	50–59	GAMET	[TEXT]
FA	60–99	Not assigned	Not assigned
UA	01–59	Routine aircraft reports	ICAO AIREP
UA	60–69	Special aircraft reports, except for volcanic ash	ICAO AIREP
UA	70–79	Special aircraft reports, related to volcanic ash	ICAO AIREP
UA	80–99	Routine aircraft reports	ICAO AIREP

Note: Noting that there is no known use of the series 80–99, these series were allocated to routine aircraft reports up to 1 September 2008. After 1 September 2008, the series are reserved for future

## *Annexure-II*

### **Explanation of Data Designators T1T2A1A2ii CCCC**

#### **TABLE C6 Data type designator A1 (when T1 = I or J)**

Instructions for the proper application of the level designators.

- (1) The designators specified in this table should be used to the greatest extent possible to indicate the type of data contained within the body of the BUFR bulletin.
- (2) Where more than one data type is contained in the bulletin, the designators for only one of the data types should be used.
- (3) When the table does not contain a suitable designator for the data types, an alphabetic designator which is not assigned in the table should be introduced and the WMO Secretariat notified.
- (4) Content of ISMx, ISIx, ISNx messages corresponds to the content of traditional SYNOP messages SMxx, Slix, SNxx.
- (5) Category/Subcategory = 000/000 identifies SYNOP data from 01, 02, 04, 05, 07, 08, 10, 11, 13, ..UTC). Thus SNxx in traditional SYNOP corresponds to ISNx in BUFR.
- (6) Designators A1 for T1T2 already used for satellite data (e.g. IUC, IUR, IUT) are not allocated and reserved for future allocations, pending the allocation of A1 for T1T2 = IN (satellite data).

<b>T1</b>	<b>T2</b>	<b>A1</b>	<b>ii</b>	<b>Data Type</b>	<b>TAC correspondence</b>	<b>Data Category Sub Category(Common Table C13)</b>
<b>I</b>	<b>N</b>	<b>A</b>		Satellite data (AMSUA).		<b>003/003</b>
<b>I</b>	<b>N</b>	<b>B</b>		Satellite data (AMSUB).		<b>003/004</b>
<b>I</b>	<b>N</b>	<b>H</b>		Satellite data (HIRS).		<b>003/005</b>
<b>I</b>	<b>N</b>	<b>M</b>		Satellite data (MHS).		<b>003/006</b>

T1	T2	A1	ii	Data Type	TAC correspondence	Data Category Sub Category (Common Table C13)
I	O	B		Buoy observations	Buoy	001/025
I	O	I		Sea ice		
I	O	P		Sub-surface profiling float	TESAC	031/004
I	O	R		Sea surface observations	TRACKOB	031001
I	O	S		Sea surface and below soundings	BATHY, TESAC	031/005
I	O	T		Sea surface temperature		
I	O	W		Sea surface waves	WAVEOB	031/002
I	O	X		Other sea environmental		
I	O	Z		Deep ocean tsunami meter		031/007

T1	T2	A1	ii	Data Type	TAC correspondence	Data Category Sub Category (Common Table C13)
I	P	C		Radar composite imagery data		
I	P	I		Satellite imagery data		
I	P	R		Radar imagery data		
I	P	X		Not defined		

T1	T2	A1	ii	Data type	TAC correspondence	Data Category Sub Category (Common Table C13)
I	S	A	01-29	Routinely scheduled observations for distribution from automatic (fixed or mobile) land stations (e.g. 0000, 0100, ... or 0220, 0240, 0300, ..., or 0715, 0745, ... UTC)	n/a	000/006
I	S	A	30-59	N-minute observations from automatic (fixed or mobile) land stations	n/a	000/007
I	S	B		Radar reports (parts A and B)	RADOB	006/003
I	S	C	01-45	Climatic observations from land stations	CLIMAT	000/020
I	S	C	46-	Climatic observations from marine stations	CLIMAT SHIP	001/020

			59			
I	S	D		Radiological observation	RADREP	010/001
I	S	E		Measurement of surface ozone		008/000
I	S	F		Source of atmospheric	SFAZI, SFLOC, SFAZU	000/030
I	S	I	01-45	Intermediate synoptic observations from fixed land stations	SYNOP (SIxx)	000/001 000/051
I	S	I	46-59	Intermediate synoptic observations from mobile land stations	SYNOP MOBIL	000/004
I	S	M	01-45	Main synoptic observations from fixed land stations	SYNOP (SMxx)	000/002 000/052
I	S	M	46-59	Main synoptic observations from mobile land stations	SYNOP MOBIL	000/005
I	S	N	01-45	Synoptic observations from fixed land stations at non-standard time (i.e. 01, 02, 04, 05, ... UTC)	SYNOP (SNxx)	000/000 000/050
I	S	N	46-59	Synoptic observations from mobile land stations at non-standard time (i.e. 01, 02, 04, 05, ... UTC)	SYNOP MOBIL	000/003
I	S	R		Hydrologic reports	HYDRA	000/040
I	S	S	01-19	Synoptic observations from marine stations	SHIP	001/000
I	S	S	20-39	One-hour observations from automatic marine stations	n/a	001/006
I	S	S	40-59	N-minute observations from automatic marine stations	n/a	001/007
I	S	T	01-19	Tide gauge observations	n/a	001/030
I	S	T	20-39	Observed water level time series	n/a	001/031
I	S	V		Special aeronautical observations (SPECI)	SPECI	000/011
I	S	W		Aviation routine weather observations (METAR)	METAR	000/010
I	S	X		Other surface data	IAC, IAC FLEET	

T1	T2	A1	ii	Data type	TAC correspondence	Data Category Sub Category (Common Table C13)
I	T	A		Administrative message		
I	T	B		Service message		
I	T	R		Request for data (inclusive of type)		
I	T	X		Other text messages of information		

T1	T2	A1	ii	Data type	TAC correspondence	Data Category Sub Category (Common Table C13)
I	U	A		Single level aircraft reports (automatic)	AMDAR	004/000
I	U	A		Single level aircraft reports (manual)	AIREP/PIREP	004/001
I	U	B		Single level balloon reports	n/a	
I	U	C		(used for single level satellite-derived reports – see Note 3)	SAREP/SATOB	005/000
I	U	D		Dropsonde/Dropwindsondes	TEMP DROP	002/007
I	U	E		Ozone vertical sounding	n/a	008/001
I	U	I		Dispersal and transport analysis	n/a	009/000
I	U	J	01-19	Upper wind from fixed land stations (entire sounding)	PILOT (parts A, B, C, D)	002/001
I	U	J	20-39	Upper wind from mobile land stations (entire sounding)	PILOT MOBIL (parts A, B, C, D)	002/003
I	U	J	40-59	Upper wind from marine stations (entire sounding)	PILOT SHIP (parts A, B, C, D)	002/002
I	U	K	01-19	Radio soundings from fixed land stations (up to 100 hPa)	TEMP (parts A, B)	002/004
I	U	K	20-39	Radio soundings from mobile land stations (up to 100 hPa)	TEMP MOBIL (parts A, B)	002/006
I	U	K	40-59	Radio soundings from marine stations (up to 100 hPa)	TEMP SHIP (parts A, B)	002/005
I	U	L		Total ozone		008/002
I	U	M		Model derived sondes		
I	U	N		Rocket sondes		
I	U	O		Profiles of aircraft observations in ascending /descending	AMDAR	002/020
I	U	P		Profilers	PILOT	002/010
I	U	Q		RASS temperature profilers	TEMP	002/011
I	U	R		(used for radiance data – see Note 3)		
I	U	S	01-19	Radiosondes/pibal reports from fixed land stations (entire sounding)	TEMP (parts A, B, C, D)	002/004
I	U	S	20-39	Radio soundings from mobile land stations (entire sounding)	TEMP MOBIL (parts A, B, C, D)	002/006
I	U	S	40-59	Radio soundings from marine stations (entire sounding)	TEMP SHIP (parts A, B, C, D)	002/005
I	U	T		(used for satellite-derived sondes – see Note 3)	SATEM, SARAD, SATOB	
I	U	U	01-45	Monthly statistics of data from upper-air stations	CLIMAT TEMP	002/025
I	U	U	46-59	Monthly statistics of data from marine stations	CLIMAT TEMP, SHIP	002/026

I	U	W	01-19	Upper wind from fixed land stations (up to 100 hPa)	PILOT (parts A, B)	002/001
I	U	W	20-39	Upper wind from mobile land stations (up to 100 hPa)	PILOT MOBIL (parts A, B)	002/003
I	U	W	40-59	Upper wind from marine stations (up to 100 hPa)	PILOT SHIP (parts A, B)	002/002
I	U	X		Other upper air reports		

T1	T2	A1	ii	Data type	TAC correspondence	Data Category Sub Category (Common Table C13)
J	O	I		Sea ice		
J	O	S		Sea surface and below soundings		
J	O	T		Sea surface temperature		
J	O	W		Sea surface waves		
J	O	X		Other sea environmental data		

T1	T2	A1	ii	Data type	TAC correspondence	Data Category Sub Category (Common Table C13)
J	S	A		Surface area forecast (e.g. airways)		
J	S	D		Radiological forecast	RADOF	
J	S	M		Surface forecasts (e.g. MOS)		
J	S	O		Maritime forecast	MAFOR	
J	S	P		Forecast amendments (airways)		
J	S	R		Hydrologic forecast	HYFOR	
J	S	S		Forecast amendments (TAF)		
J	S	T		Aerodrome forecast (TAF)		
J	S	X		Other surface forecasts		

T1	T2	A1	ii	Data type	TAC correspondence	Data Category Sub Category (Common Table C13)
J	T	E		Tsunami		
J	T	H		Hurricane, typhoon, tropical storm warning		
J	T	S		Severe weather, SIGMET		
J	T	T		Tornado warning		
J	T	X		Other warnings		



<b>T1</b>	<b>T2</b>	<b>A1</b>	<b>ii</b>	<b>Data type</b>	<b>TAC correspondence</b>	<b>Data Category Sub Category (Common Table C13)</b>
J	U	A		Forecast at single levels		
J	U	B		Binary coded SIGWX, Embedded Cumulonimbus		
J	U	C		Binary coded SIGWX, Clear air turbulence		
J	U	F		Binary coded SIGWX, Fronts		
J	U	N		Binary coded SIGWX, Other SIGWX parameters		
J	U	O		Binary coded SIGWX, Turbulence		
J	U	S		Forecast soundings		
J	U	T		Binary coded SIGWX, Icing/Tropopause		
J	U	V		Binary coded SIGWX, Tropical storms, sandstorms, volcanoes		
J	U	W		Binary coded SIGWX, High-level winds		
J	U	X		Other upper air forecasts		