Validation of Kalpana-l atmospheric motion vectors against upper air observations and numeri cal model derived winds

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Validation of Kalpana-1 atmospheric motion vector (AMVs) against upper air radiosonde (RS) winds and numerical model-derived winds (National Centre for Medium Range Weather Forecasting's (NCMRWF's) T382L64 first guess) during the monsoon season of 2011 was attempted in this study. This was the first attempt to compare Kalpana-1 AMVs with model-derived winds. An AMV validation against RS winds showed that the mean AMV speed is always higher than that of the mean RS speed, except in high-level cloud motion vectors (CMVs). In the southwest monsoon season of 2011, the maximum speed bias in kalpana-1 AMV with respect to RS winds was observed in the middle level 5 ms^{-1} The root mean square vector difference (RMSVD) of Kalpana-1 AMV with respect to the collocated RS winds (~5-7m s^{-1}) has been found to be in the same range as those of other geostationary satellites, especially over the northern hemisphere and the tropics. The validation of Kalpana-1 AMVs against first guess revealed more erroneous low-level and middle-level AMVs, but the vector difference in the high-level winds was found to be smaller than the same in the low-and middle-level winds. The uncertainty in the empirical genetic algorithm (GA) used to drive Kalpana-1 AMVs, which does not use model background fields, may be the reason for the high RMSVD of Kalpana-1 AMVs with respect to RS winds and high bias with respect to first guess. The mean observed AMV clearly depicted monsoonal features such as low-level westerly jet (LLWJ) and tropical easterly Jet (TEJ). The speed bias density plots of Kalpana-1 high-level CMVs (400-100 hPa) and water vapour channel winds (WVWs) (above ~500hPa) with respect to first guess showed that the bias was higher for WVWs; however, the standard deviations of high-level CMVs and WVWs are comparable.