ITPP-5.12 RETRIEVALS ON McIDAS SYSTEM

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1. INTRODUCTION

Satellites play an important role in monitoring the trends of temperature distribution on a large scale basis. The International TOVS Processing Package (ITPP) by the Cooperative Institute for Meteorological Satellite Studies (CIMSS) at the University of Wisconsin-Madison diagnoses vertical profiles of atmospheric temperature and humidity from the radiance measurements of NOAA polar orbiting platform. ITPP-5.12, which has been installed at METRI Remote Sensing Research Laboratory is only for a global usage to need a surface data to generate atmospheric soundings and total ozone amount. And retrieved TOVS (TIROS Operational Vertical Sounder) temperatures are utilized as an initial data for mesoscale numerical weather prediction model (Marshall, 1989, 1995).

McIDAS stands for Man-computer Interactive Data Analysis System. The McIDAS application was developed at the University of Wisconsin-Madison Space Science Engineering Center in the early 1970's to display and manipulate satellite imagery from Polar and Geostationary satellites. The system has developed further to allow satellite data, output from NWP models and observational data to be processed and displayed. The TOVS data retrieval scheme is embedded in the METRI McIDAS and a sample is shown by Fig. 1.

The principal aims of these efforts is to retrieve TOVS-derived meteorological fields and to superimpose these on AVHRR imagery with NOAA/HRPT using McIDAS-X 7.5. In this study results of the evaluation of ITPP-5.12-derived temperatures are presented.

2. DATA AND PROCESSING PROCEDURE

Infrared radiances from TOVS have already been used to retrieve temperature, ozone contents, using statistically and physically based on the various methods (Smith et al, 1979, 1993).

From the HRPT (High Resolution Picture Transmission) data stream TIP (TIROS Information Processor) data of each available orbit and AVHRR (Advanced Very High Resolution Radiometer) data from the near-zenith orbits are extracted and archived. The process takes place on a WETNET Unix workstation.

TOVS data has been processed by ITPP-5.12 since September 1998 at the Remote Sensing Research Lab., METRI. ITPP-5.12 temperatures have been compared with radiosonde observations for October, November and December, 1998. The locations of the radiosonde stations whose data were used are Seoul, Phohang, Kwangju and Cheju.
3. EVALUATION OF ITPP-5.12-DERIVED TEMPERATURE

ITPP-5.12 temperatures have been compared with radiosonde observations for October, November and December, 1998. Figure 2 and 3 show the temporal variation of 850 and 500 hPa temperatures at the four stations by radiosonde and ITPP-5.12 measurements within 40km and 2 hour in space and time. It can be seen that ITPP-5.12 data generally follow the trend shown by the radiosonde data. However, in many cases large ITPP-5.12 retrieval errors can be observed. Table 1 show the collocation statistics for 850 and 500 hPa. The RMSE (Root Mean Square Error) differences in comparison to the radiosonde values can be seen to generally lie between 1 and 2°C through most of the troposphere. The RMSE for 850 and 500 hPa are 1.63 and 1.49.
Fig. 2. 850 hPa temperature from a radiosonde and NOAA-12, 14 TOVS at Seoul(a), Pohang(b), Kwangju(c) and Cheju(d) for the period 4 Oct. to 5 Dec. 1998.

Fig. 3. The same as Fig. 2, except for 500 hPa.
Table 1 Mean, standard deviation and correlation, rms error(°C) and etc between TOVS and radiosonde temperatures for October - December 1998.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>STDEV</th>
<th>CORR</th>
<th>RMSE</th>
<th>MBE</th>
<th>Sample Size</th>
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<td>ITPP5.12</td>
<td>Radiosonde</td>
<td>ITPP5.12</td>
<td></td>
<td></td>
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<tr>
<td>850 hPa Temperature (°C)</td>
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<td>8.01</td>
<td>4.57</td>
<td>4.16</td>
<td>0.94</td>
<td>1.63</td>
</tr>
<tr>
<td>500 hPa Temperature (°C)</td>
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<td>-17.35</td>
<td>4.50</td>
<td>4.45</td>
<td>0.94</td>
<td>1.49</td>
</tr>
</tbody>
</table>

4. RESULTS AND DISCUSSION

TOVS retrieved outputs produced by ITPP-5.12 installed at the METRI are 850 hPa temperature and dew point temperature, wind vector and stream line, 700 hPa temperature and dew-point temperature, 500 hPa geopotential height and total ozone etc. For the verification of satellite data, vertical temperature and dew-point temperature data from TOVS and RAOB are compared. Especially, a comparison of 850, 500 hPa temperatures estimates derived using TOVS data from NOAA with radiosonde measurements for four stations in Korea are made.

TOVS processing using the new method are smaller bias relatively rather than those of TOVS using climate surface data. The improvement in the new retrieval scheme for temperature and dew point temperature at the METRI may provide to be still critical to analyze the long-term trend of temperature. A plan for the next generation meteorological satellite is established to adopt rapidly to NOAA-15 and to produce improved products.

5. ACKNOWLEDGEMENTS

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6. REFERENCES


TECHNICAL PROCEEDINGS OF THE TENTH
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