

On application of TOVS data in Korea

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1. ABSTRACT

The International TOVS(TIROS Operational Vertical Sounders) Process Package(ITPP-IV), which has been installed at Korea Meteorological Administration(KMA), is only for a global usage to need a surface data to generate atmospheric soundings and total ozone amount. And retrieved TOVS temperature are utilized as an initial data of a mesoscale numerical weather prediction model. For the verification of satellite data, vertical temperature and dew-point temperature data from TOVS and RAOB are compared. The impact of retrieved TOVS temperature to the numerical weather prediction model for a case of cyclone development are investigating now. KMA also is trying to improve the quality of TOVS total ozone amount using real-time synoptic observations in various ways instead of climatological data because this retrieved data in the new scheme for total ozone presently used at the KMA may critically provide to analyzed the long-term trend of ozone structure over the Korean peninsula. A plan for the next generation meteorological satellite is established to adopt rapidly to NOAA-K and to produce improved products.

2. INTRODUCTION

Satellites play an important role in monitoring the trends of total ozone amount distribution on a large scale basis. This paper briefly describes the techniques used to measure ozone distribution from space. These include nadir or limb viewing to measure the backscattered ultraviolet radiation from different layers in the stratosphere and mesosphere, observing infrared emission usually around the $9.6\mu\text{m}$ ozone absorption band. The $9.7\mu\text{m}$ ozone absorption band is used in conjunction with other HIRS channels, and temperature and water vapor profiles to

obtain total ozone column in TOVS(Yoshito, 1992). Despite the inherent problems in measurement associated with operating instruments, satellite-based observations have already provided important information on the spatial and temporal distribution of ozone on a global basis. Some of the data collected are also vital to the long term trend problem.

The ITPP-IV installed by the KMA is made for a global usage, which needs a surface data to generate atmospheric sounding(Cho *et al.*, 1991). If the initial input process in the ITPP-IV is not modified, it takes climatic surface data for producing sounding data in general. The method described here employs the radiative transfer equation and uses the statistical relationships between HIRS radiances and ozone amount to establish a first-guess profile(Ma *et al.*, 1984). Results from the new algorithm are compared with those from the original and with surface-based observations of total ozone used by Dobson Spectrophotometer measurements.

3. DATA AND PROCESSING PROCEDURE

Infrared radiances from TOVS have already been used to retrieve ozone contents, using statistically and physically based on the various methods(Smith, 1970). This total ozone retrieval algorithm to be employed here can be summarized as following. To specify the initial guess field of ozone amount may be used by HIRS radiances with the regression relationships between the radiances and total ozone amount. The detailed Radiative Transfer Equation(RTE) of a physical temperature sounding method is shown by Smith(1970) and Le Marshall *et al.*(1991).

Two cases of ozone distributions for 00UTC 15 and 23 March are chosen for intercomparisons of retrieved ozone fields.

4. RESULTS AND DISCUSSION

TOVS retrieved outputs produced by ITPP-IV installed at the KMA are 850hPa wind vector and stream line, 700hPa temperature and dew-point temperature, 500hPa geopotential height and total ozone(Fig. 1, 2).

Especially, a comparison of total ozone estimates derived using TOVS data from NOAA with total ozone measurements from a Dobson Spectrophotometer are made. Differences of simultaneous and collected ozone amounts such as Yonsei Dobsometer observations, TOVS using the new method are smaller bias relatively rather than those of TOVS using climate surface data. This study shows that the TOVS retrieved total ozone amount used by synoptic surface observations can delineate more accurate rather than those used by climate surface data.

The improvement in the new retrieval scheme for total ozone at the KMA may provide to be still critical to analyze the long-term trend of ozone amount. In the near future a regression method should be applied to derive the accurate total ozone amounts from ATOVS observations received at KMA, and the regression coefficients should be determined by the Yonsei Dobsometer's and Pohang observations.

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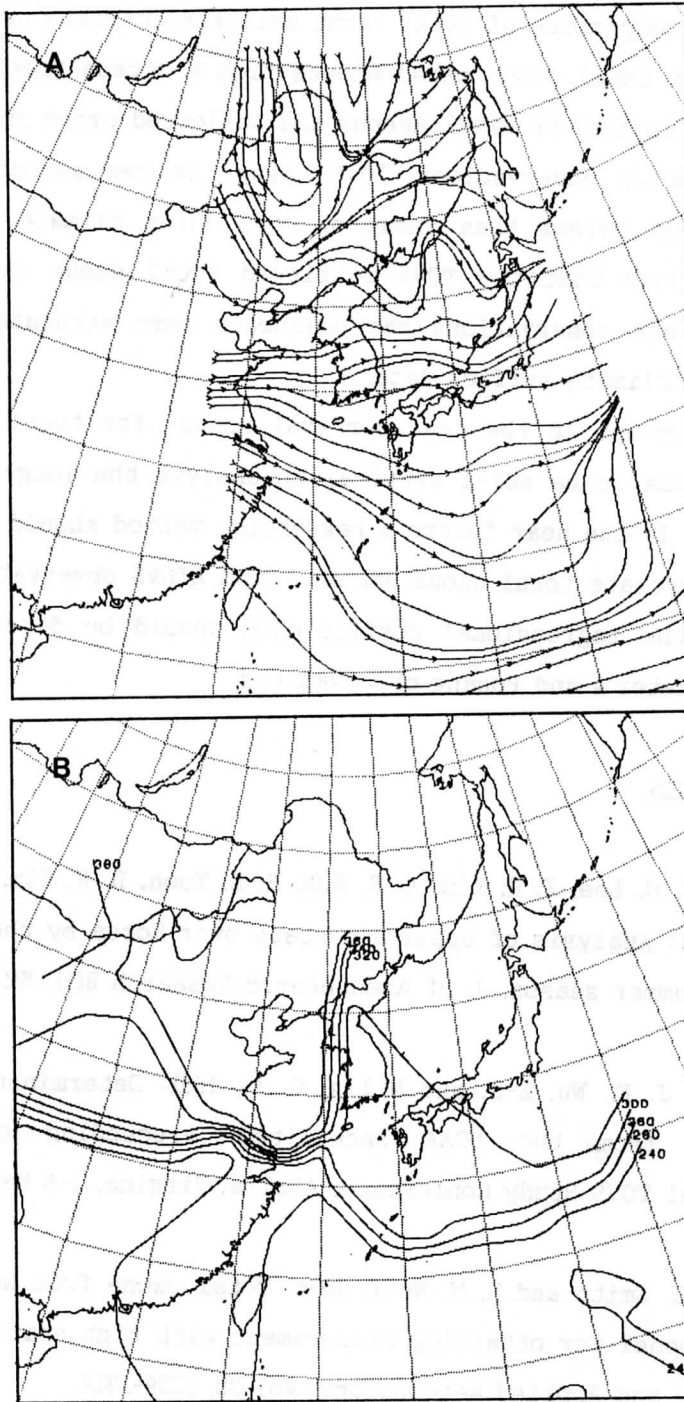


Fig. 1. Contour maps of TOVS retrieved 850hPa stream line(A) and total ozone(B) at 0500UTC 5 February 1997, respectively

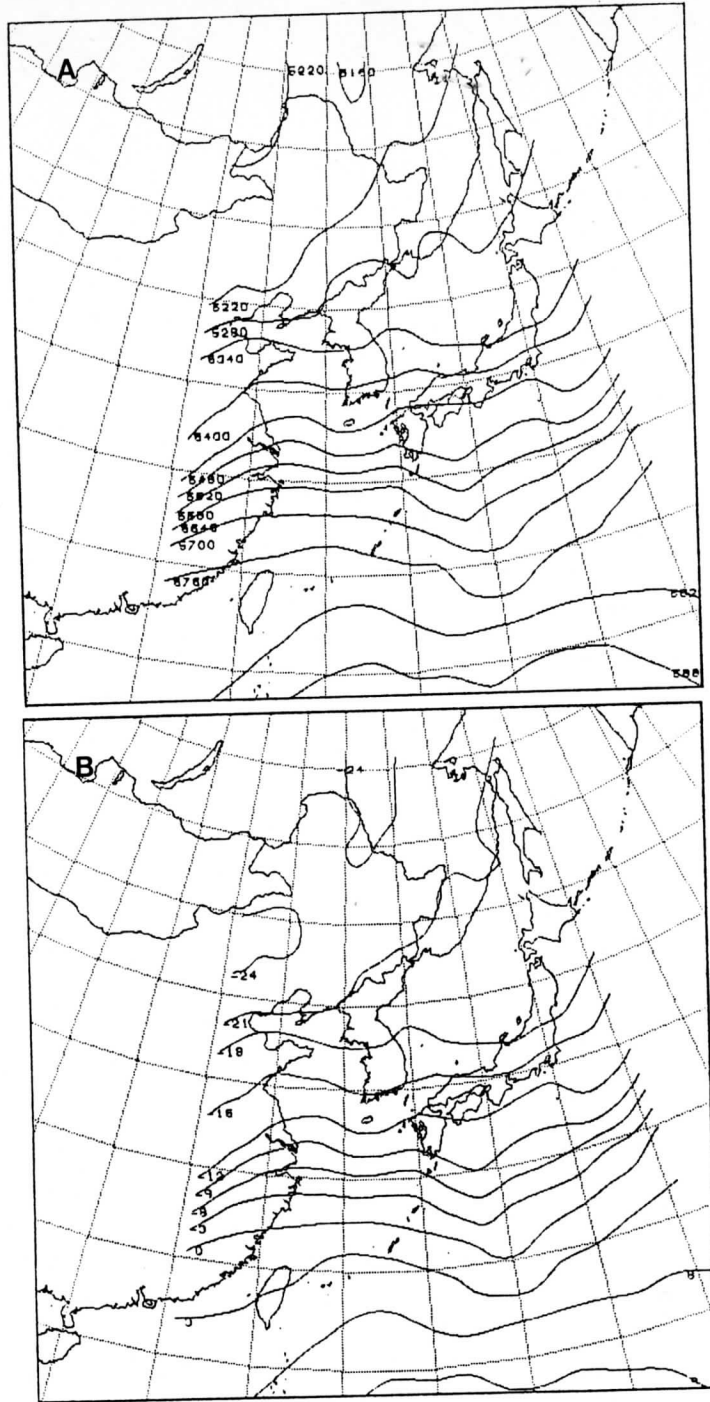


Fig. 2. Same as Fig. 1 except for 500hPa geopotential height(A) and 700hPa temperature.

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