ASSIMILATING FY-3A VASS DATA INTO CHINESE 3DVAR ASSIMILATION SYSTEM （GRAPES 3DVAR）

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1. INTRODUCTION

The significant improvement to weather forecast skill due to directly assimilating the satellite-observed radiance data was witnessed. Chinese Meteorological Administration has developed a three dimensional data assimilation system (Grapes 3Dvar), and with the radiance data directly assimilated by RTTOV as observation operator.

On 27 May 2008, China has successfully launched the FY-3A meteorological satellite as a research and development (R&D) satellite, with 11 payloads mounted, which are Visible and InfraRed Radiometer (VIRR), MEdium Resolution Spectral Imager (MERSI) MicroWave Radiation Imager (MWRI), Total Ozone mapping Unit (TOU), InfraRed Atmospheric Sounder (IRAS), MicroWave Temperature Sounder (MWTS), MicroWave Humidity Sounder (MWHS), Solar Backscatter Ultraviolet Sounder (SBUS), Solar Irradiation Monitor (SIM), Earth Radiation Measurer (ERM) and Space Environment Monitor (SEM). FY-3A data and products are open to all users, and with its primary missions as following:
Globally sounding of 3-dimensional thermal and moisture structures of the Earth's atmosphere, its cloud pattern and other key parameters measurements such as precipitation, ozone, etc., to support global numerical weather prediction and environmental services;
Globally imaging of the Earth's surfaces to monitor large scale meteorological and/or hydrological disasters and biosphere environment;
Establish long-term environmental data sets with retrieving important geophysical parameters for climate monitoring and global predication and Earth sciences researches.

FY-3A meteorological satellite contains 3 vertical atmospheric sounding instruments: MicroWave Temperature Sounder (MWTS), MicroWave Humidity Sounder and InfraRed Atmospheric Sounder, generally called Vertical Atmospheric Sounder System, i.e., VASS, which will help to improve NWP forecast skill . To assimilating the FY-3A VASS data into Chinese 3Dvar assimilation system (Grapes 3Dvar), there are many new challenging works to do, such as generation of the RTTOV coefficients for FY-3A VASS three instruments, data quality control, channel selection and bias correction, etc. In this paper, the above works on FY-3A VASS data assimilation in Grapes 3Dvar is introduced in detail. To investigate the effects of the FY-3A VASS data in NWP model, several experiments are designed, with 2 sets of assimilation experiments for typhoon track forecast conducted: one is single instrument data assimilation experiment, i.e., individually assimilating IRAS, MWTS and MWHS, the other is combinatorial data assimilation experiments, i.e., assimilating IRAS+MWTS, IRAS+MWHS, MWTS+MWHS and IRAS+MWHS+MWTS respectively. The preliminary results indicate that: the forecast skills are improved greater after FY-3A VASS data assimilation than before, and the different instrument has different effects on NWP forecast; the microwave sounders have more contribution than infrared sounder, especially obvious for the MWHS sounder; the combinatorial data assimilation experiments get more positive effect than single instrument data assimilation experiment, and the IRAS+MWHS+MWTS combinatorial data assimilation experiment has the more obviously positive effect; the positive impact on the South Hemisphere is more clear than on North Hemisphere.

In the second section, the instrument characteristics of FY-3A VASS are introduced, and its potential effects in NWP model are analyzed; The Chinese forecast/assimilation system (Grapes 3Dvar) is introduced briefly in the third section; The works on generation of the RTTOV coefficients for FY-3A VASS three instruments, data quality control, channel selection and bias correction are delineated in detail in the forth section; Several application experiments and its preliminary results are

demonstrated and analyzed in the fifth section; In the last section, the potential and effect of assimilating FY-3A data in NWP model was discussed and summarized.

2. THE INSTRUMENT CHARACTERISTICS OF FY-3A VASS

3. GRAPES 3DVAR FORECAST/ASSIMILATION SYSTEM

4. TYPE-STYLE AND FONTS

4.1. Generating the RTTOV coefficients for FY-3A VASS three instruments

4.2. Data Quality Control

4.3. Channel Selection

4.4. Bias Correction

4.5. Observation Tuning

5. SEVERAL APPLICATION EXPERIMENTS AND ITS PRELIMINARY RESULTS

6. DISCUSS AND SUMMARY

REFERENCES