Impact of assimilation of the Advanced Technology Microwave Sounder data over sea-ice in the Korean Integrated Model

Jisoo Kim¹, Myoung- Hwan Ahn¹, Juntae Choi², Jae-Gwan Kim²

¹Ewha Womans University, Seoul, Republic of Korea (kjsu231@gmail.com)
²National Meteorological Satellite Center, Jincheon-gun, Republic of Korea

Introduction

❖ In KIM system, the assimilation of microwave observations over sea-ice regions is limited due to the difficulties in estimating the surface radiation.
❖ In this study, for better utilization of sea-ice observations, the dynamically estimated emissivities is applied to the pre-processing of KIM model.

Data and method

❖ Korean Integrated Model (KIM) (Hong et al., 2018)
  ➢ The operational NWP model at the KMA
  ➢ Resolution: horizontal 12 km, vertical 91 layers
  ➢ Data Assimilation (DA): Hybrid 4D-EnVar
  ➢ Suomi-NPP/ATMS
  ➢ 22 channels: 5 window CHs, 12 temperature sounding CHs and 5 humidity sounding CHs

❖ Experimental design
  ❖ On average, 1.07% of ATMS observations is additionally assimilated per window time.
  ❖ Distribution of First Guess (FG) departure
    ➢ CH7
    ❖ Impact on background compared to ECMWF IFS
      ➢ STDV of FG departures of AMSU-A, MHS, normalized by values for the CTRL
      ➢ Impact of assimilation of the Advanced Technology Microwave Sounder data over sea-ice in the Korean Integrated Model

❖ Summary
  ➢ Assimilation of sea-ice data improved the analysis and forecast by warming the T fields at high-latitude of NH.
  ➢ This suggest that assimilation of sea-ice data is possible with dynamic emissivity.

Results

❖ Impact on analyses fields compared to ECMWF IFS
  ➢ A reduction of cold bias in temperature (T) analysis over high-latitude region of the NH (red circle).
  ➢ Reduced the analysis RMSD below 850 hPa.
  ➢ Reduced forecast error in temperature fields especially in the high-latitude of the NH, although there was a little degradation in the SH.

❖ Horizontal distribution of temporally averaged zonal mean RMSD difference (EXP-CTRL)
  ➢ In humidity fields, it shows combined results.

❖ Impact on forecasts compared to ECMWF IFS
  ➢ Reduced forecast error in temperature fields especially in the high-latitude of the NH, although there was a little degradation in the SH.

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