Assimilation of surface-sensitive microwave radiances over East Asia in GRAPES

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ABSTRACT

This study is focused on the assimilation of surface-sensitive satellite microwave radiances over East Asia in GRAPES. A scheme of land surface emissivity is introduced. The land surface emissivity of those window channels is firstly retrieved from the satellite observation. The emissivity of database is used in case of the retrieval failed. The characteristics of retrieved emissivity are analyzed, especially over Tibetan Plateau, together with the comparison with that of database.

1. Background and methodology

The assimilation of satellite microwave radiance plays an important role in the numerical weather forecast over East Asia. However, lots of surface-sensitive satellite observations are not used because of the complex surface condition over East Asia. What's more, for the Tibetan Plateau with the highest Altitude in the world, even the assimilation of those satellite data with less surface-sensitivity in general sense presents a difficult issues.

To improve the assimilation of microwave sounder radiance over East Asia in GRAPES, a scheme of land surface emissivity is introduced. The land surface emissivity of those window channels is firstly retrieved from the satellite observation. The retrieval is then used in the assimilation of satellite data. It is not only the window channel takes the emissivity retrieval, but also the sounder channel near the window channel gets the retrieved emissivity. The emissivity of database is used in case of the retrieval is failed. In this report, we will introduce the analysis of the characteristics of retrieved emissivity, especially over Tibetan Plateau, together with the comparison with that of database.

2. Impact of surface emissivity schemes on O-B of sounding channels

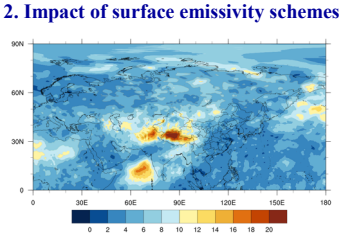

Fig.1: Mean RMS(H_NCEP-H_ECMWF) at 500hPa for July 2009.

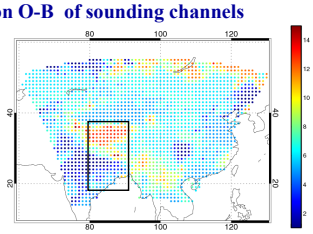

Fig.2: Mean Land Types from CRTM

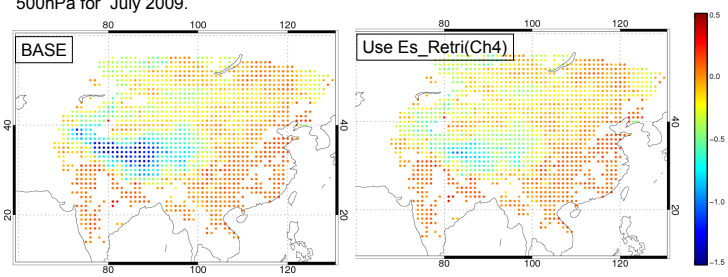

Fig.3: <O-B>, August 1-7.2012. ATMS CH7 54.4GHz

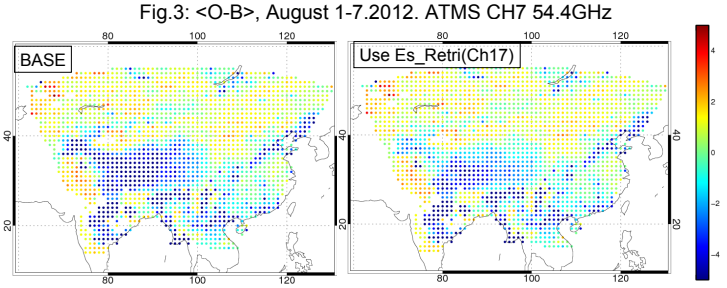

Fig.4: <O-B>, August 1-7,2012, ATMS CH18 183±7GHz

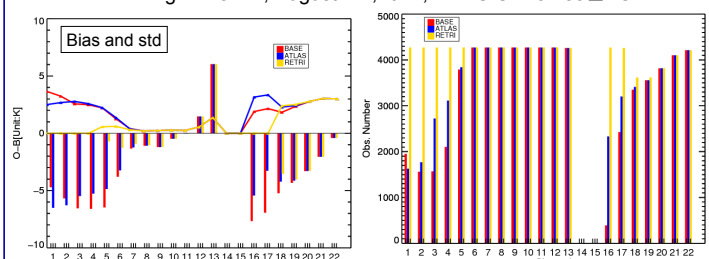

Fig.5: <O-B> before bias correction and number of used observations for land type 13 over Tibetan Plateau.

3. Mean surface emissivity for window channels

$$\varepsilon_\alpha = \frac{R_\alpha - R_u - \tau R_d}{\tau(B(T_s) - R_d)}$$

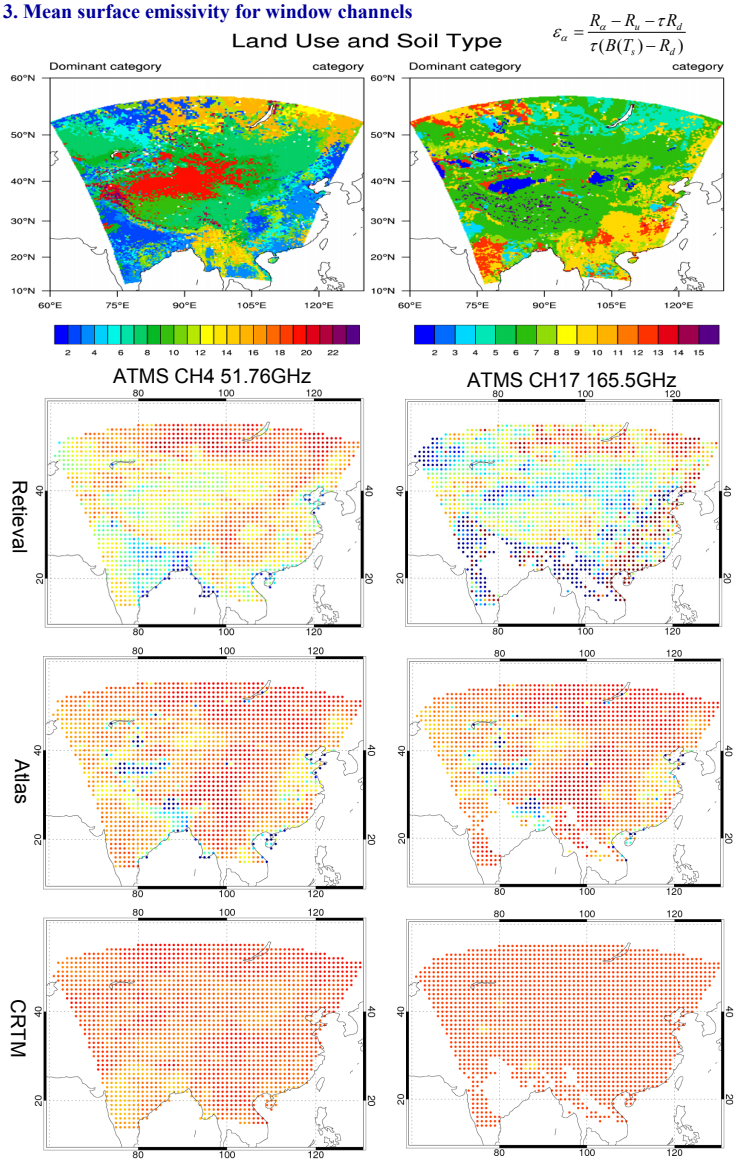

Fig.6: Mean Suface Emissivity for ATMS Ch4 and Ch17at 18Z UTC over the period 1-7 August 2012.

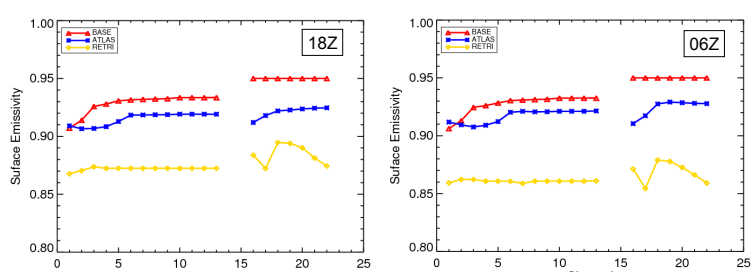

Fig.7: Mean surface emissivity for land type 13 over Tibetan Plateau in the thee schemes at 18Z (2AM, local time) and 06Z(2PM,local time)

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