Satellite Observations of CH$_4$ using CrIS and its comparison with AIRS and IASI

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The Cross-track Infrared Sounder (CrIS) on the NPP/JPSS in conjunction with Atmospheric InfraRed Sounder (AIRS, since August, 2002), the Infrared Atmospheric Sounding Interferometer (IASI, since 2008) can provide realistic 4-D concentrations of CH$_4$ over 20 years. This unique data set will help to monitor the CH$_4$ change associated with global change, particularly the permafrost thawing, clathrate in the Arctic regions.

1. INTRODUCTION

Fig. 1 CrIS, AIRS and IASI can provide over 20 years Observation of CH$_4$.

2. CH$_4$ Retrieval from CrIS/AIRS/IASI

- Better channels are available from finer spectral resolution;
- Full spectrum of CrIS data is required to get a parallel CH$_4$ product as AIRS and IASI;
- Precision is ~1.5%; sensitive to 150-700 hPa.

3. Highlights of Some Results

3.1. Strong enhancement over the South Asia in Monsoon Season (Xiong et al., 2009, ACP)

Fig.4 Spatial distribution of MUT-CH$_4$ over south Asia in summer (left), its seasonal variation (upper right) and trend (lower right).

3.2. Detection of CH$_4$ depletion during stratospheric Intrusion (Xiong et al., 2013, GRL)

Fig. 5 Distribution of CH$_4$ from AIRS at 407 hPa and the contour of tropopause (left panels) and total ozone amount from AIRS (overlaid with wind vectors at 400 hPa, right panels) for three days on 3/25, 3/27, and 3/29/2010. Dark blue regions in the left panels are air masses with low CH$_4$, impacted by stratospheric intrusion, and the enhancement of ozone is evident in the corresponding regions in the right panels.

3.3. Significant Increase of MUT-CH$_4$ is about one year delayed as compared to CH$_4$ in MBL (Xiong et al., Remote Sensing, 2010)

Fig. 6 The time series AIRS MUT-CH$_4$ (black) and its comparison with CH$_4$ in the MBL (red) in HNH, NH and SH.

Acknowledgments:
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