1DVAR studies with SEVIRI data and the HIRLAM model

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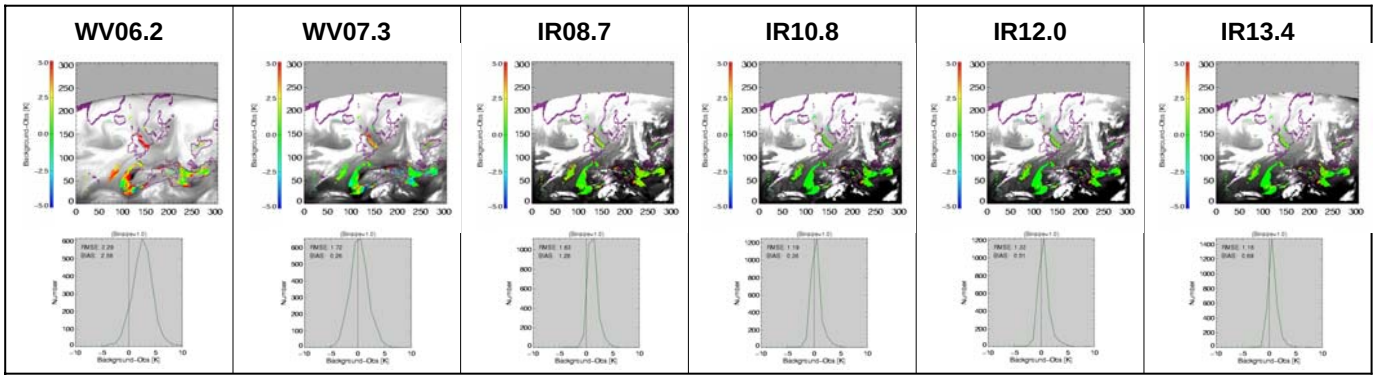
Martin Stengel
Swedish Meteorological and Hydrological Institute

Abstract

Potential use of SEVIRI (Spinning Enhanced Visible and Infra-Red Imager) data in the HIRLAM (High Resolution Limited Area Model) model VAR analysis is being investigated at SMHI. In this context the SAF NWC software is employed to process brightness temperatures and cloud products. Initially, we test the performance of SEVIRI IR-channels simulations using RTTOV-7 as observation operator. These simulations are being done utilizing the HIRLAM model output to set up the atmospheric conditions. Using these results, bias-and rmse-monitoring of SEVIRI measurements and HIRLAM model equivalents in observation space has been performed for clear sky and is presented for 30 day period. Furthermore, a preliminary study addressing the possible utilization of SEVIRI clear sky IR radiances within HIRLAM VAR analysis system is displayed. This study includes achievements of a 1D-VAR code that analyses HIRLAM profiles and colocated SEVIRI data.

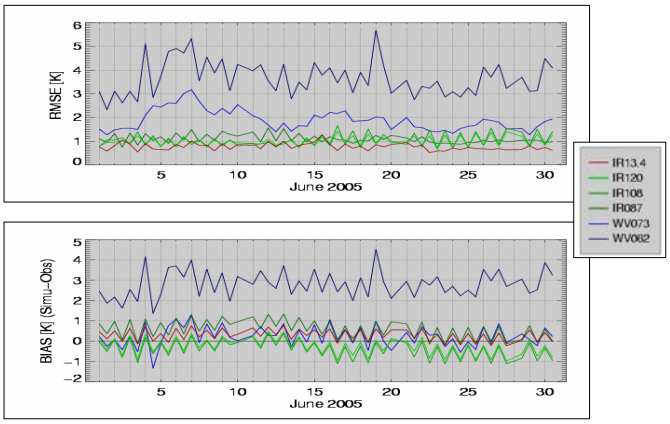
HIRLAM 6h Forecast Data in Observation Space (Case Study, June 1st 2005 12UTC)

Comparisons to observations are shown for clear sky areas over ocean (difference fields and histograms)



RMSE and BIAS Monitoring

Time period: June 2005
(clear-sky ocean pixels only)



Future Work

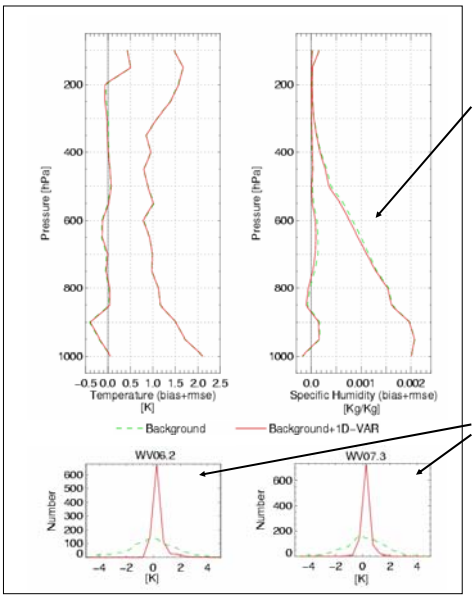
SEVIRI clear-sky measurements will be utilized within the HIRLAM 3D-VAR and 4D-VAR assimilation system at SMHI. Possible data thinning, realistic observation error estimates and appropriate bias correction methods are currently investigated. Low peaking IR channels will be considered also for land areas while providing land surface emissivity data.

Towards the possible use of cloudy infra-red radiances, 1D-Var retrievals of moisture and temperature profiles for cloudy situations will be performed as a first step. The assimilation of cloudy SEVIRI radiances within 3D-VAR and/or 4D-VAR systems is a high ambition and is considered as a long-term goal.

1D-VAR Experiments:

Time period: 13th to 30th of June 2005
Control vector: Profiles of Spec. Humidity and Temperature, Surface Pressure, Surface Temperature
Background: HIRLAM 6h forecast fields
Comparison: around 800 Radiosondes

	WV06.2	WV07.3
Bias correction	2.6K	0K
Observation error	0.3K	0.3K



A mid-tropospheric humidity increment is found, which decreases the error when comparing to radiosondes.

Brightness temperature differences before and after 1D-Var.

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