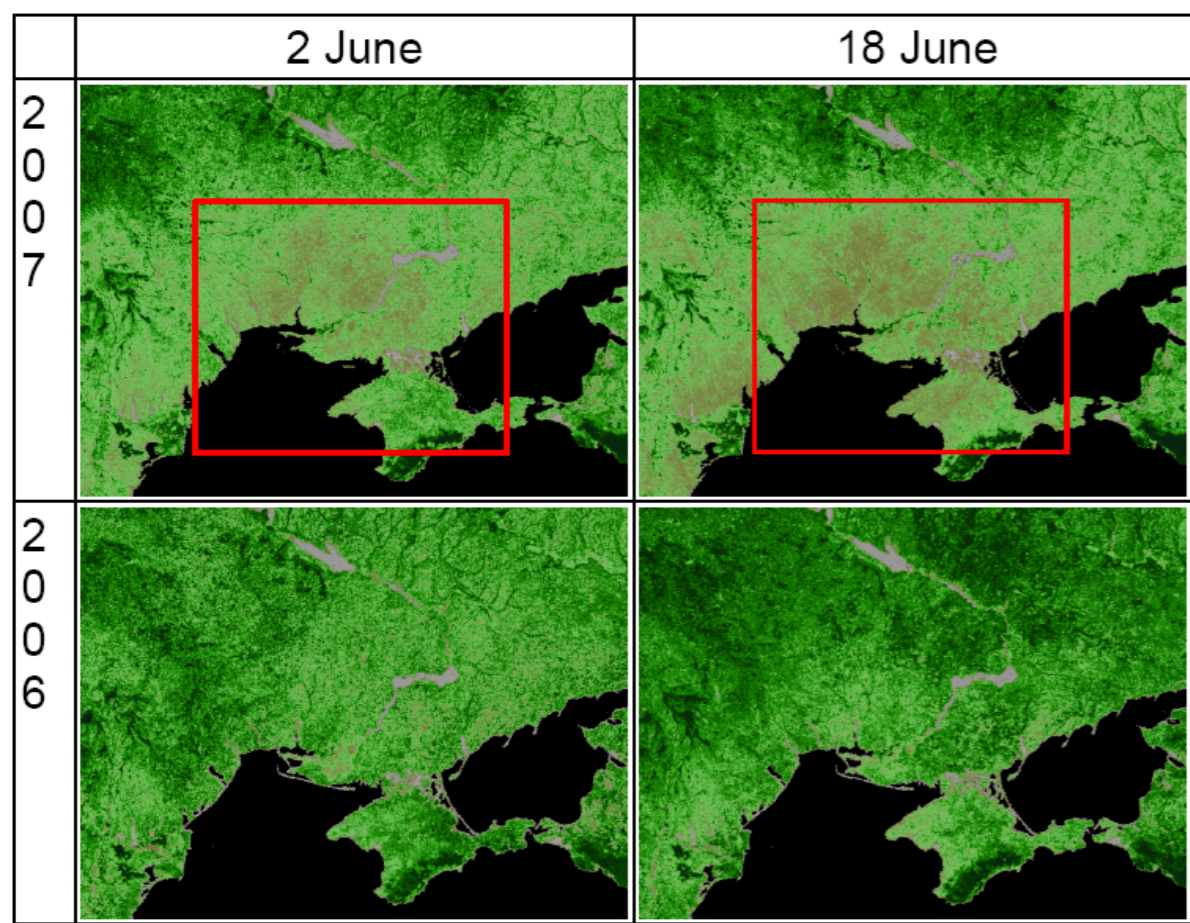


Simulation cascade of NWP and land surface model for drought monitoring

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Evolution of EVI in 2006 & 2007 vegetation seasons. Drought affected territories are highlighted by red rectangle

Severe Drought Events

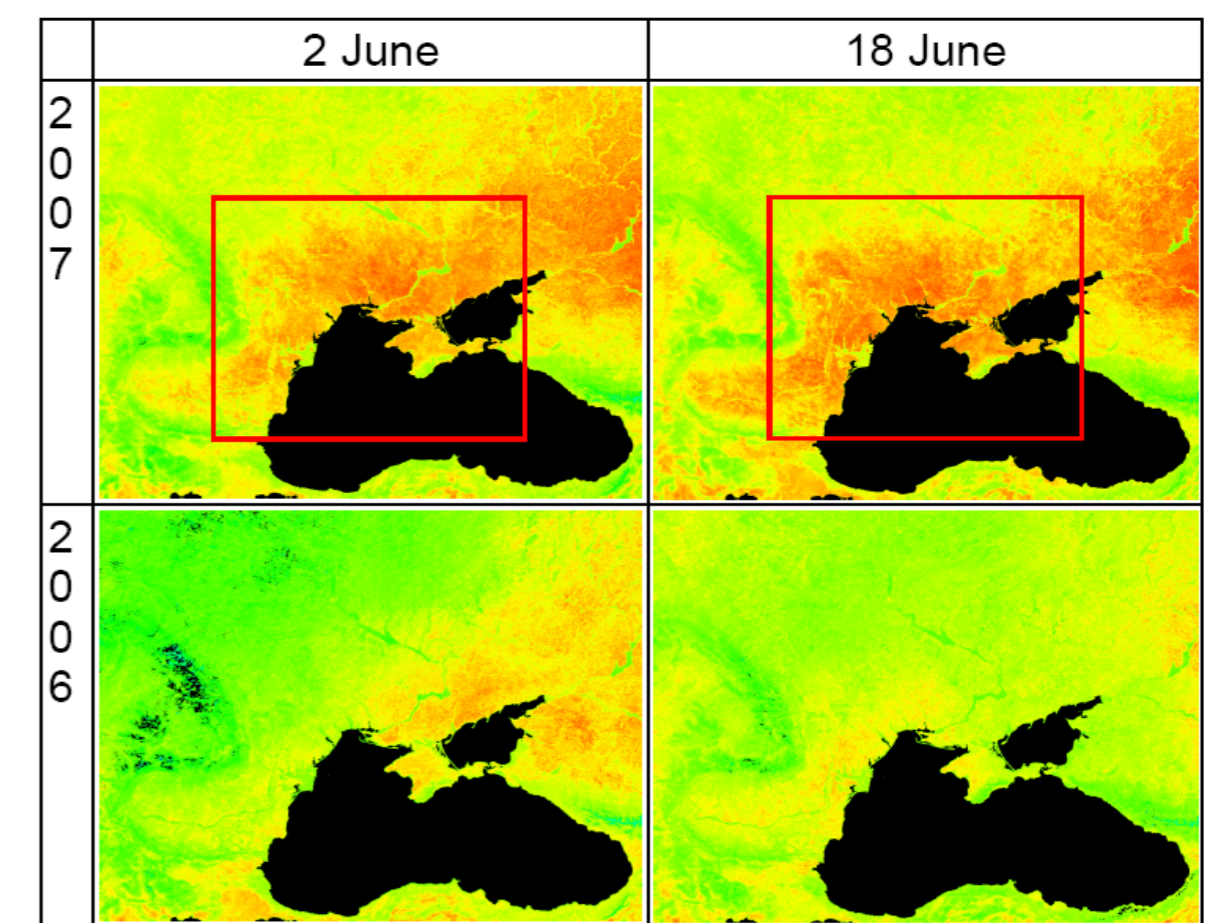
In spring-summer 2007 southern regions of Ukraine were heavily affected by droughts:

- 1,4 million ha of crops totally destroyed
- 8,5 million ha of crops damaged
- 100 million of U.S. dollars losses
- disaster of national level

Drought Indicators

- Soil moisture
- Soil temperature
- Vegetation health
- Vegetation water content

To monitor drought by estimating soil moisture and temperature profiles we propose to use a cascade of Numerical Weather Prediction and Land Surface Model.



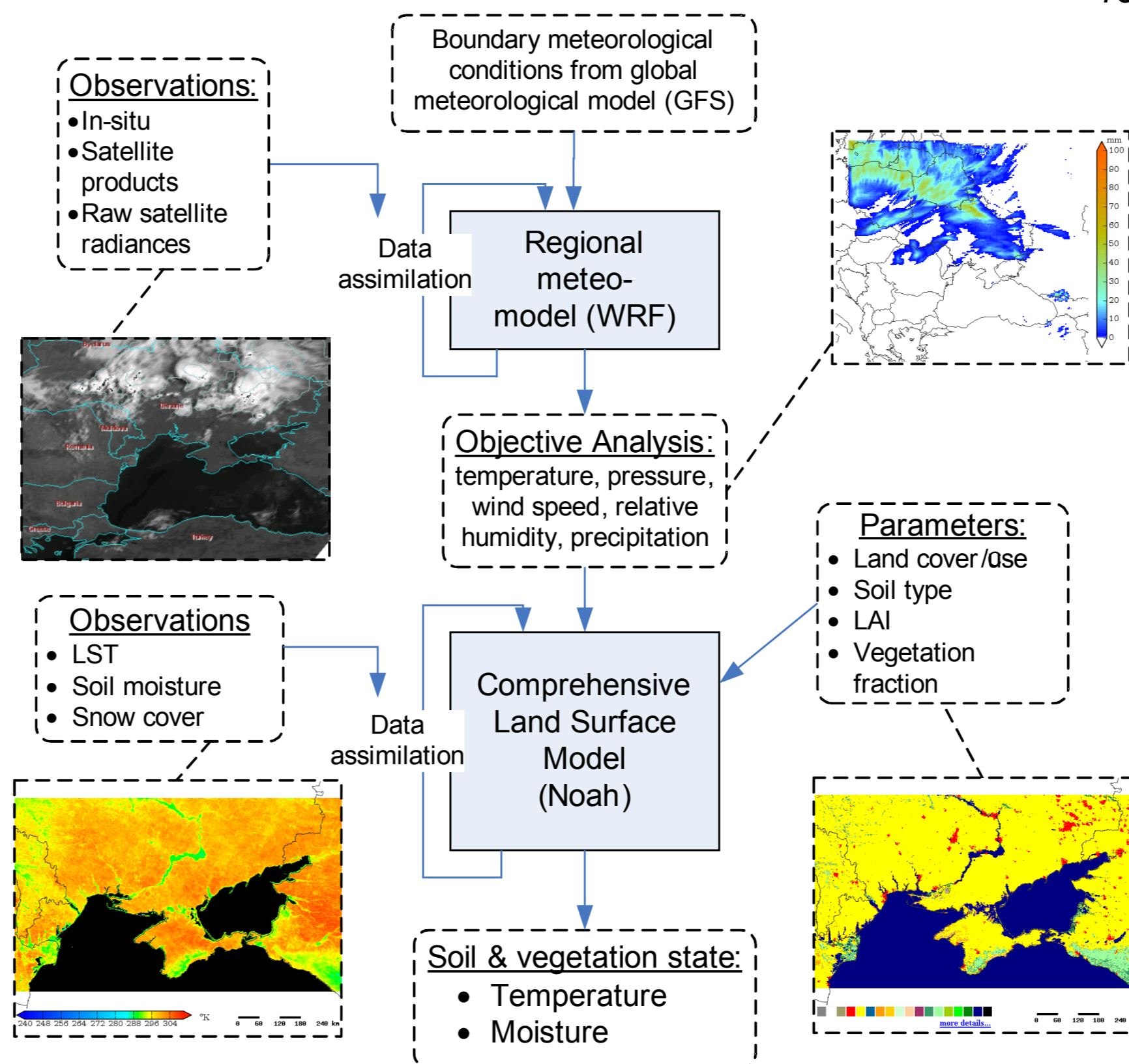
Evolution of land surface temperature in 2006 & 2007 vegetation seasons. Drought affected territories are highlighted by red rectangle

NWP Modelling

- Mesoscale WRF model (Weather Research & Forecasting)
 - Finer resolution, require forecast frames from global models for boundary conditions
 - Variational Data Assimilation support
 - Support for distributed memory cluster architectures
- WRF was adapted and configured for territory of Ukraine

Current WRF Configuration

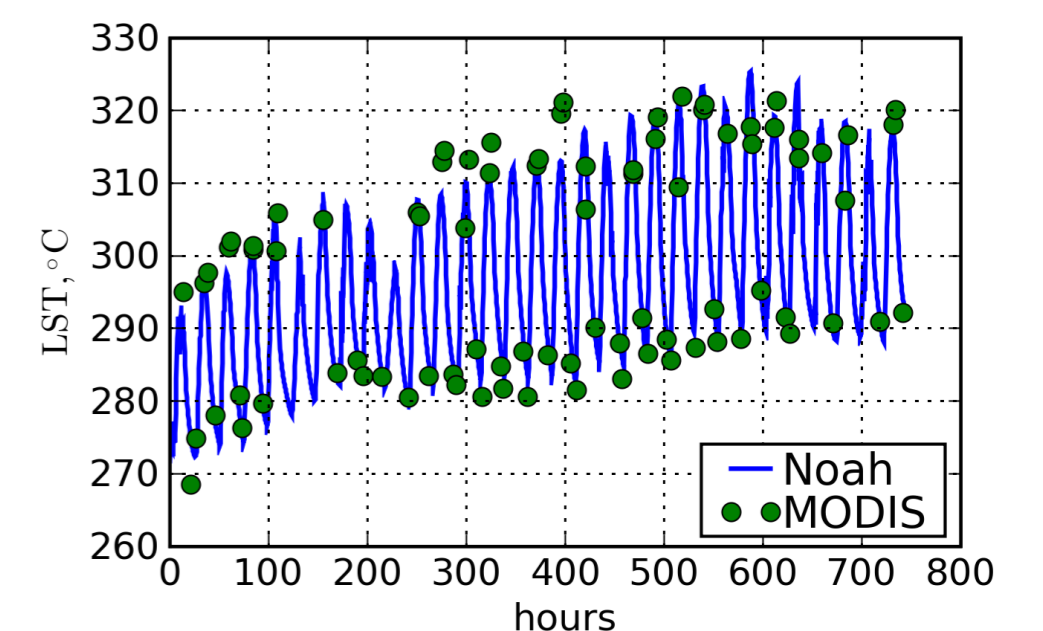
- Configured for territory of Ukraine
- Boundary condition from GFS model
- 3 day forecasts, every 6 hours
- 10 km horizontal grid, 200x200 gridpoints
- 31 vertical levels. One run takes 4 hours on 2x2 Opteron system



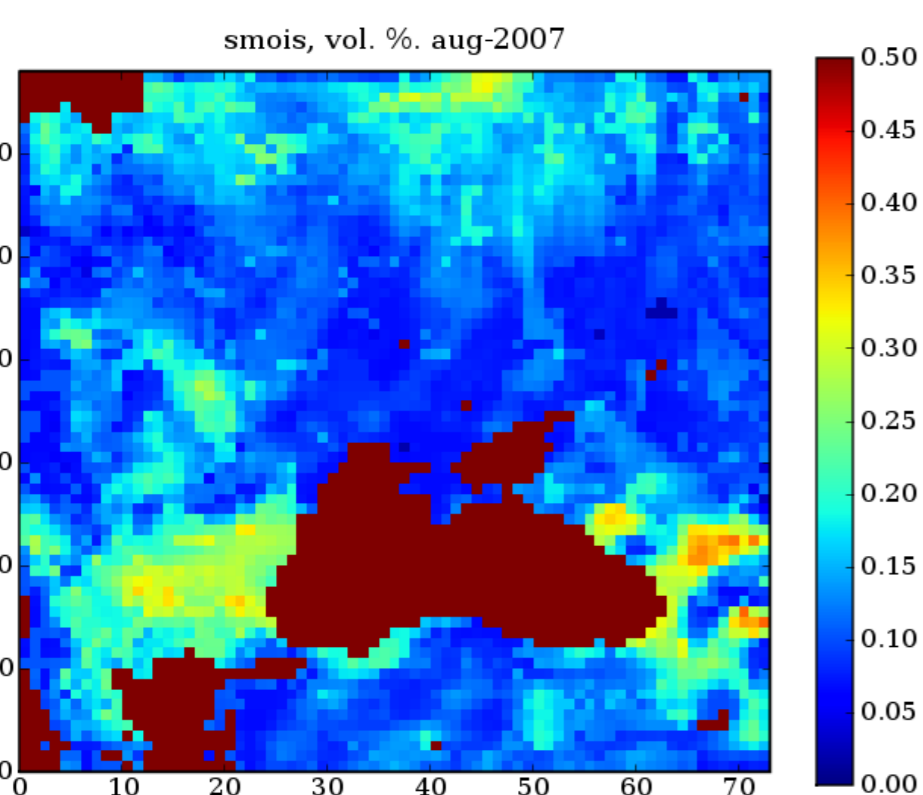
Modelling cascade for drought monitoring in Ukraine

Land Surface Modelling

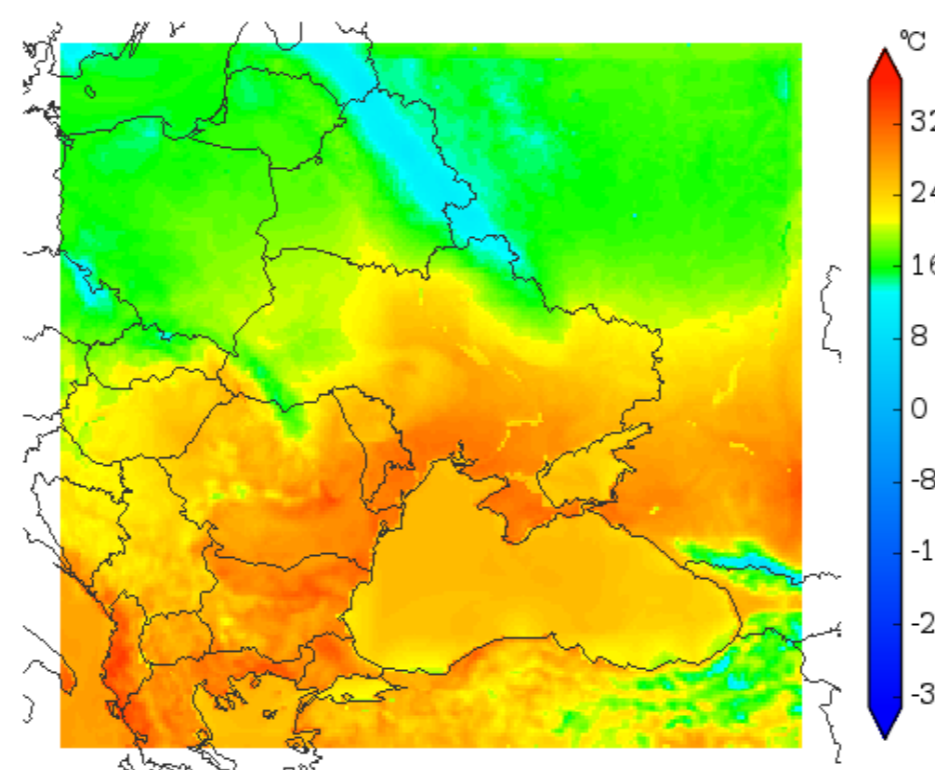
- Examples: Noah, CLM, VIC
- 1-d models
- Noah is used operationally in GFS, MM5 and WRF models



Noah performance in Kherson site (semi-desert). Simulated land surface temperature vs. MODIS retrievals in May 2007

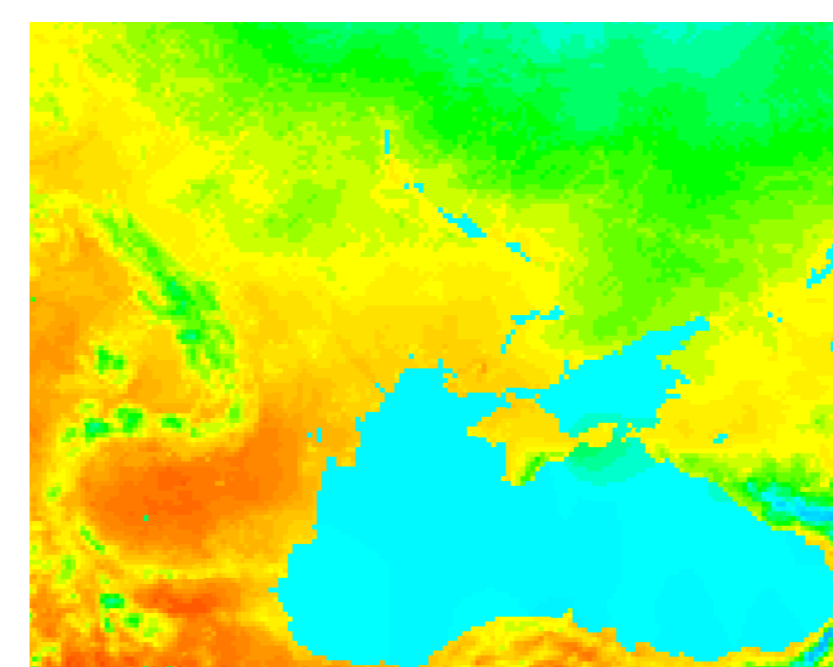


Noah model simulations. Monthly average of soil moisture (0-10 cm) in August 2007.

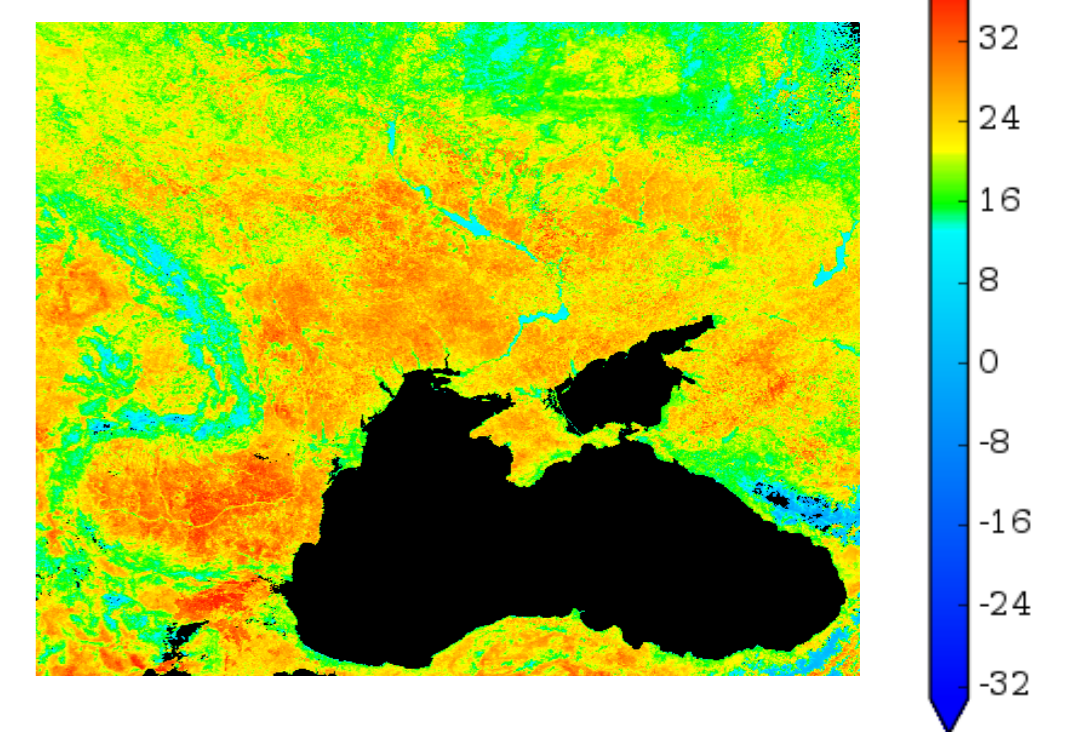


Air temperature (at 2 m) forecast using WRF model. Forecast is valid at 2007-07-23 06:00 UTC

Model Validation



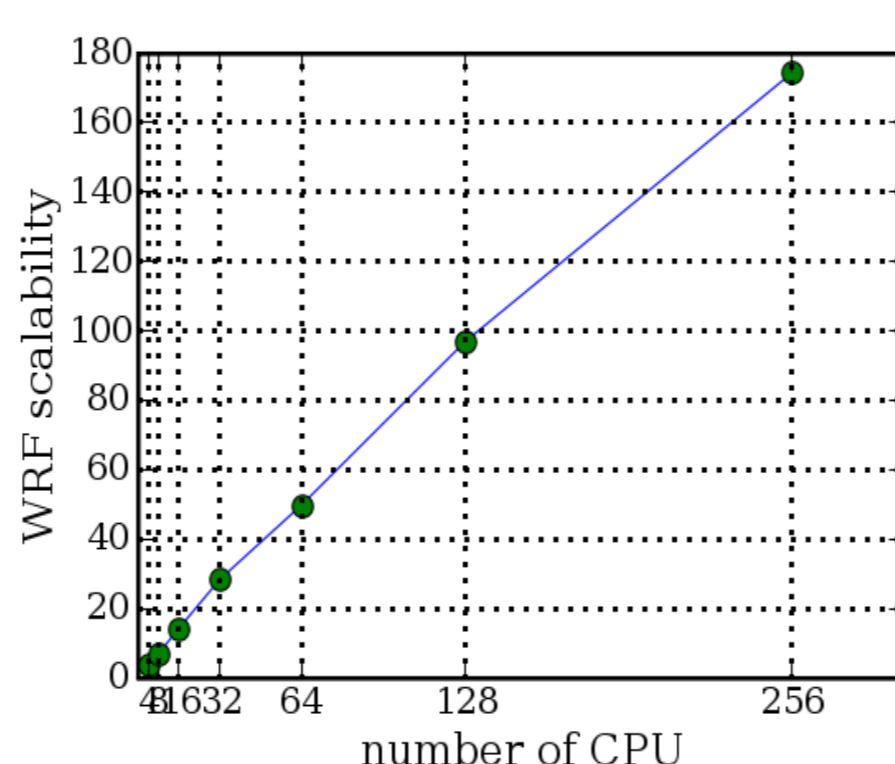
WRF/Noah



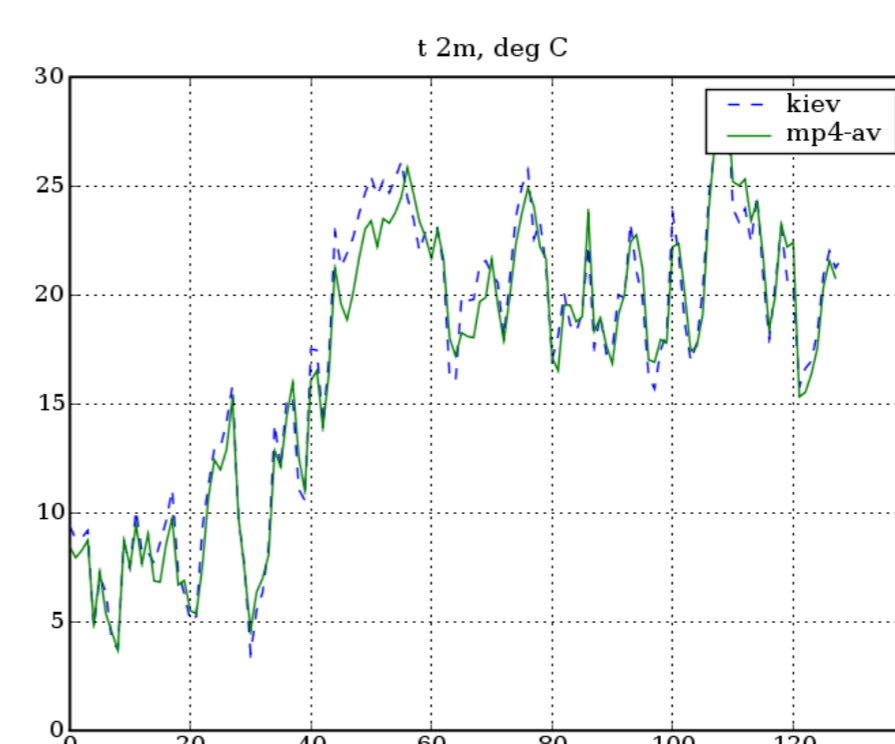
MODIS (MOD11)

Noah model validation. Average day land surface temperature (2007.05.01-2007.05.08)

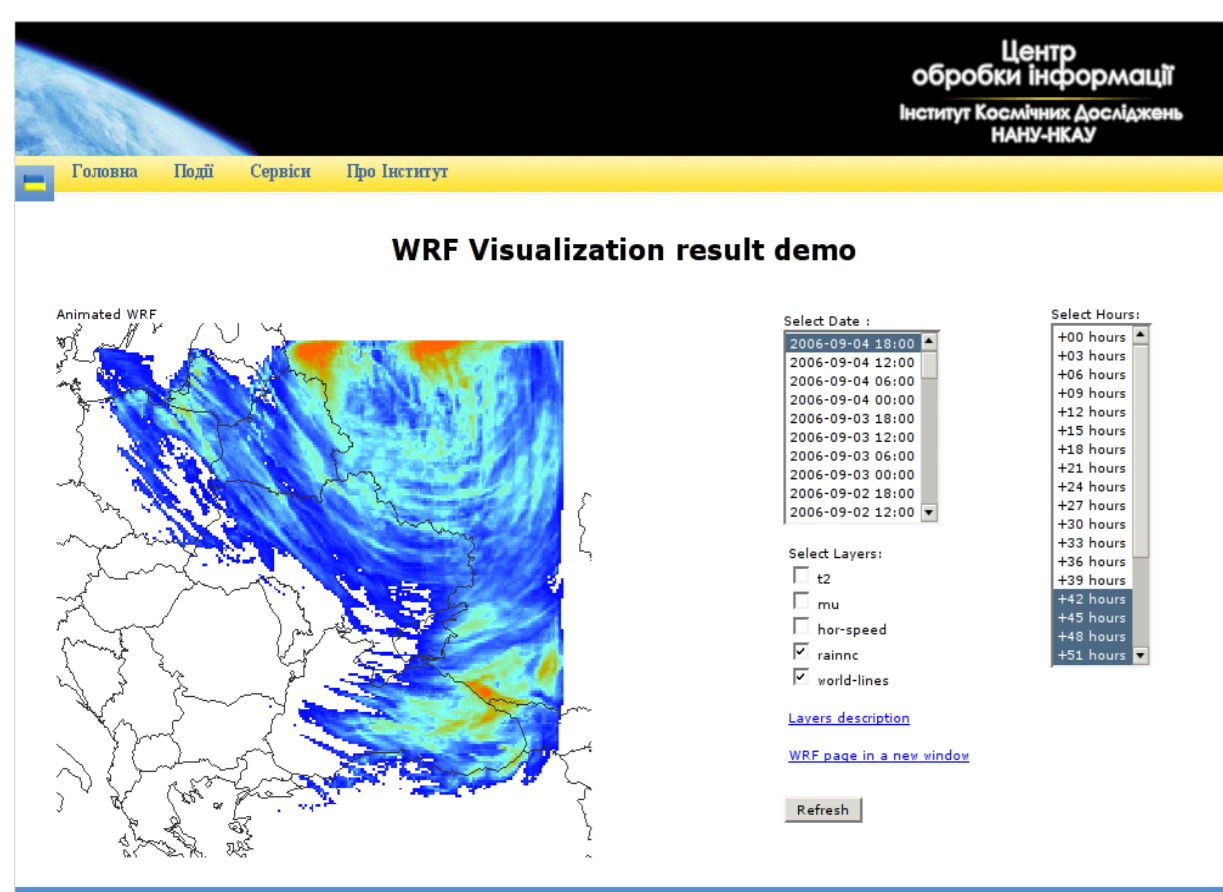
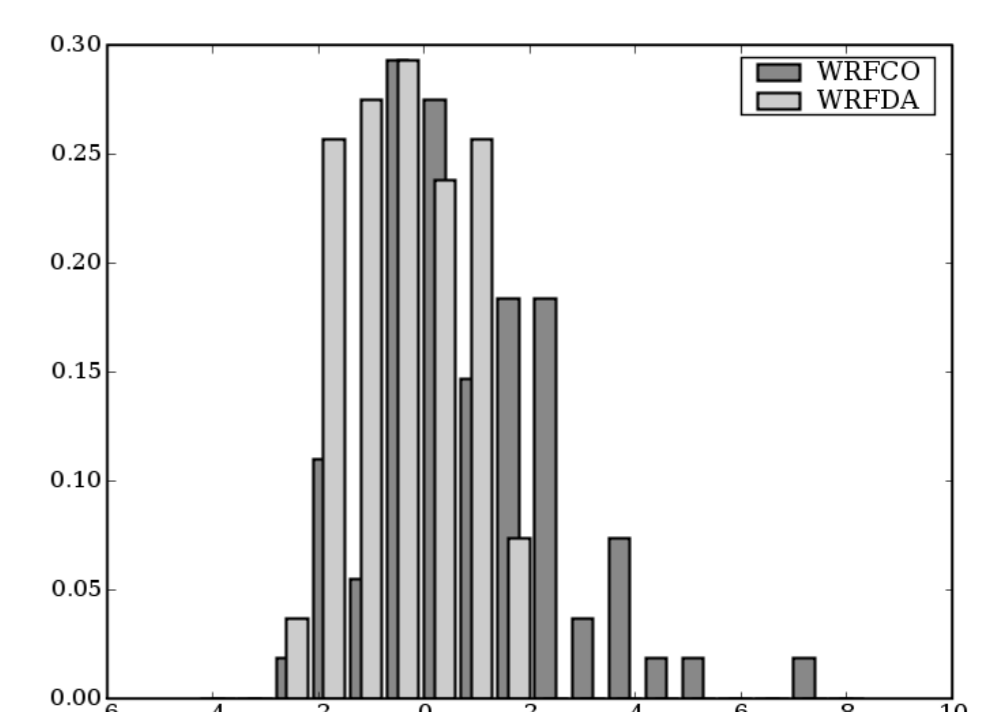
WRF Performance



WRF scalability on SCIT-3 cluster of IC NASU



Air temperature. WRF vs in-situ (Kyiv) in April-August 2007



Visualization of WRF Forecasts
http://dos.ikd.kiev.ua/?option=com_wrf