COSMO Science Plan: soil & surface

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COSMO GM
Science Plan
Soil and surface aspects

• The drafts of WG3b related COSMO Science Plan summary have been distributed to the community in July 2013:
  • SVAT scheme (Juergen Helmert)
  • Parameterization of lakes (Dimitrii Mironov)
  • Parameterization of sea ice (Dimitrii Mironov)
  • External parameters (Juergen Helmert)

Opportunity to give your feedback now !!!
Science Plan
SVAT scheme

Background strategy

• Due to the numerous dependencies between the NWP system and the SVAT model, a **deep understanding** of the capabilities and limitations of the SVAT model is required in the *operational services*.
• TERRA, which was developed at DWD, is running **safely** and **efficiently** since many years **at all scales**.

**TERRA is further chosen as basis for COSMO NWP.**

Coupling with other SVAT models supports the further development of TERRA, through intercomparison studies.
Science Plan

SVAT scheme

Main actions planned in a short-term perspective (2015-2017)

• Revision of the *ground heat flux* formulation – consideration of vegetation shading;

• Revision of *plant water uptake* – impact of vegetation properties;

• Implementation of *advanced soil properties data sets*, e.g. Harmonized World Soil Database;

• Model *intercomparison* and *validation* studies (SRNWP data pool) to identify future fields of development activities;

• Identification of processes to be used in *statistical physics* approach.
Science Plan
SVAT scheme

Main actions planned in a long-term perspective (2018-2020)

- Improve the simplified treatment of infiltration, interception, and run-off from surface and ground. Due to numerical problems, a revised approach should be considered and extended to possible stream flow routing;

- Assimilation of remote sensing soil moisture observations for SVAT model initialisation, or other approaches improving the initial state of the soil.
Science Plan
SVAT scheme

_Not_ in the COSMO Science Plan:
new features included in common COSMO / ICON library (2014)

- Multi-layers snow model;
- Representation of sub grid scale surface heterogeneity through the tile approach.
Science Plan
SVAT scheme

*Not in the COSMO Science Plan: developments planned in the CLM community*

- Revised coupling between soil and atmosphere (currently turbulent surface fluxes are computed at different locations in the model);
- 3D soil (multiple horizons, moving water table);
- Urban model;
- Dynamic vegetation;
- C and N cycle.
Science Plan, feedback

SVAT scheme

• [SPM] Start a focused action to evaluate TERRA limitations and potentials?
• [SPM] Can improvement of water budget wait for 2018?
• ...
Science Plan

Lakes

Main actions planned in a short-term perspective (2015-2017)

• FLake should be brought into operational use by COSMO members;
• Operational results should be monitored and the effect of lake parameterization on the overall NWP model performance assessed;

Main actions planned in a long-term perspective (2018-2020)

• Explicit treatment of snow over lake ice;
• Extension of the temperature profile parameterization to include the abyssal layer below the seasonal thermocline;
• Collect data on the optical properties of the lake water (external parameters);
• FLake should be extended to incorporate the effect of salinity (efficient upper-ocean parameterization scheme for seasonal forecasts).
Science Plan, feedback

Lakes

- [SPM] Seasonal forecast not a focus of COSMO → is lake salinity needed?
- [SPM] Does operational monitoring belongs to Science Plan?
- ...
Science Plan

Sea ice

Main actions planned in a short-term perspective (2015-2017)
• Sea-ice scheme should be brought into operation by COSMO members;
• Operational results should be monitored;
• Consider the fractional ice cover within a COSMO grid box;

Main actions planned in a long-term perspective (2018-2020)
• The explicit treatment of snow over sea ice.
Science Plan, feedback

Sea ice

- [SPM] Does operational monitoring belongs to Science Plan?
- [RHM] Resources for working on snow over ice modelization.
- ...
Science Plan
External parameters

Main actions planned in a short-term perspective (2015-2017)

- Consolidate external parameters for the lake model *Flake*;
- Consolidate new *MODIS-based* background surface albedo;
- Consolidate alternative data sets of soil types (*Harmonized World Soil Database*, European Soil Data Base, BGR BUEK);
- Add *vertically dependent soil information* where available (e.g. depth of water reservoir or inactive layer and soil texture);
- Provide alternative vegetation characteristics using *MODIS-based phenology model*;
- Consolidate *land use data* at higher resolution than GLC2000 (e.g. *GlobCover*);
- Consolidate *orography at higher resolution* than GLOBE (e.g. *ASTER GDEM*).

*Note: cursive data sets are implemented in EXTPAR 2.0*
Science Plan
External parameters

Main actions planned in a long-term perspective (2018-2020)

• Address the uncertainties associated with the look-up tables, especially for the SVAT model;

• The determination of the roughness length should be revised;

• A new formulation of the surface-layer transfer scheme may require an additional external parameter field for the displacement height.
Science Plan, feedback

External parameters

- [RHM] Add a consistency check for the soil type peat, to support new mire parameterization
- ...