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COSMO Science Plan: soil & surface

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COSMO GM



Science Plan

Soil and surface aspects

- *Topics with lead authors*
 - **SVAT scheme** (Juergen Helmert)
 - Parameterization of **lakes** (Dimitrii Mironov)
 - Parameterization of **sea ice** (Dimitrii Mironov)
 - **External parameters** (Juergen Helmert)



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 surface energy budget : consideration of **vegetation shading**;
- Revision of **plant water uptake** – impact of vegetation properties;
- Implementation of **advanced soil properties data sets** : Harmonized World Soil Database, new formulation of soil water transport;
- Model **intercomparison** and **validation** studies (SRNWP data pool) to identify future fields of development activities;
- Identification of processes to be used in **stochastic physics** approach.



Science Plan

SVAT scheme

Main actions proposed 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**.



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Lakes

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

- Operational results should be **monitored** and the effect of lake parameterization on the overall NWP model performance assessed;

Main actions proposed 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).



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Sea ice

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

- Operational results should be **monitored**;
- Consider the **fractional ice cover** within a COSMO grid box;

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

- The explicit treatment of **snow over sea ice**.



Science Plan

External parameters

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

- Consolidate external parameters for the lake model **Flake** and **rivers**;
- Consolidate new *MODIS-based* **background surface albedo** (e.g. consideration of spectral bands);
- 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*).



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External parameters

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

- Address the **uncertainties** associated with the look-up tables, especially for the SVAT model;
- A new formulation of the surface-layer transfer scheme may require an additional external parameter field for the **displacement height**.



Thank you for your attention!