HIRLAM/HARMONIE land surface developments

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Operational status

Ongoing and planned R&D
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　Physiography

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Operational status: HARMONIE-38h1.1

DA:
  in hor: OI for screen level temperature, relative humidity and snow depth, bilinear interpolation for SST
   in ver: OI for soil temperature and soil moisture
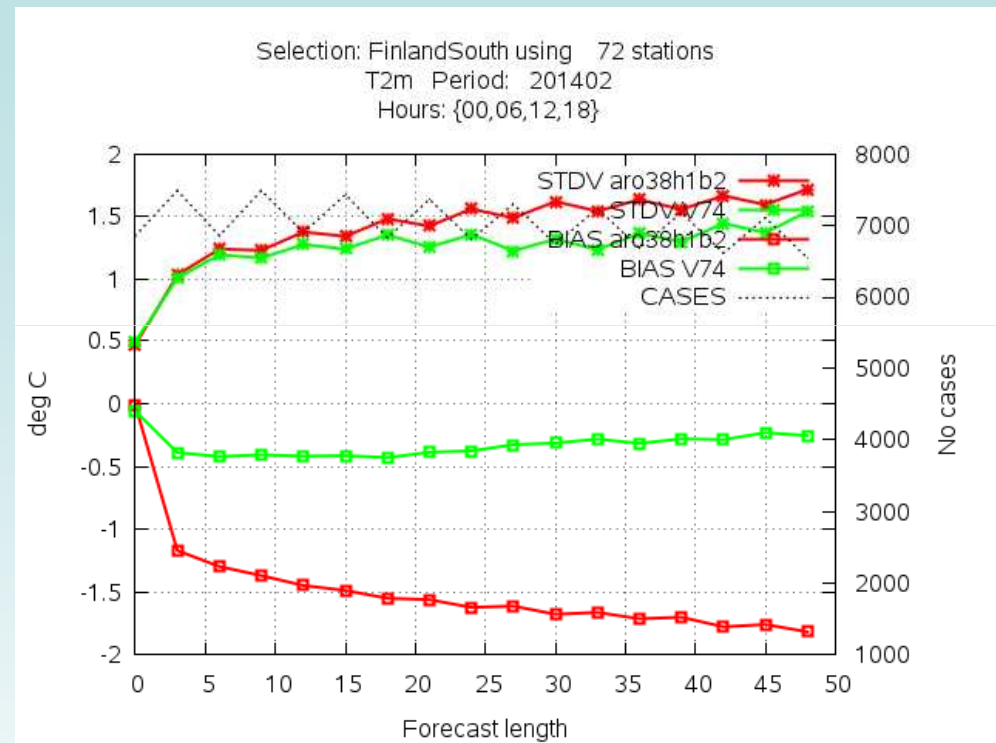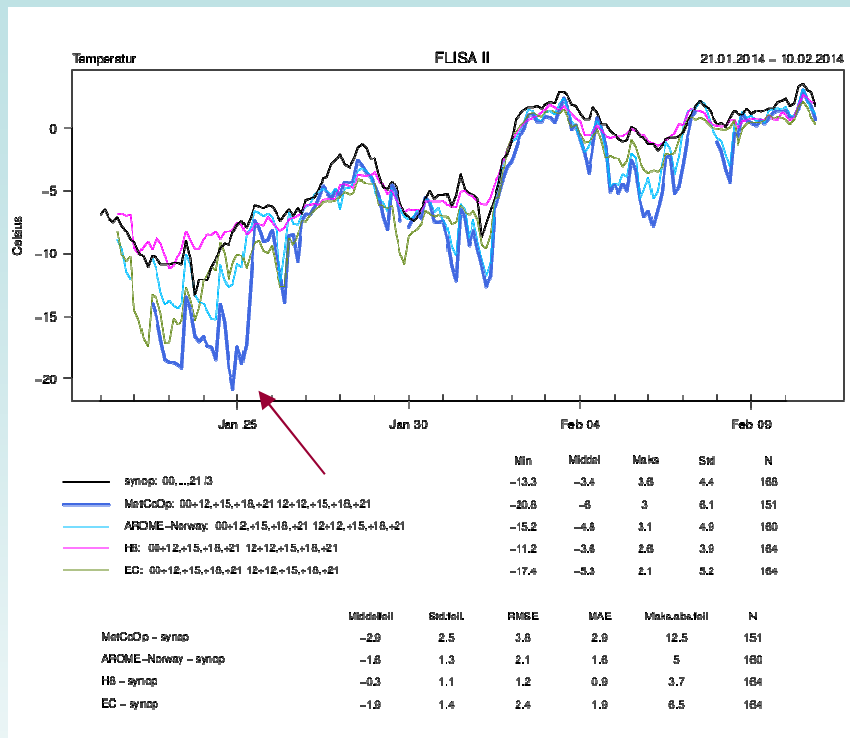**obs**: SYNOP + precipitation stations for snow in Norway, planned in Finland and Sweden, OSTIA

physiography:
  ECOCLIMAP(II), FAO soil map, GTOPO

surface layer fluxes: CANOPY
surface schemes: SURFEX7.2, 4 tiles – water and sea, urban, nature; ISBA 3L, D95 scheme for snow

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Operational status: HARMONIE-38h1.1

Problem: cold T2m bias in winter time!
Solved:
cloudiness => microphysics => cloud ice/water
thanks to Carl-Ivar Ivarsson, Eric Bazile

R&D: Technical

SODA:
   Testing, documentation,
   file formats, ISBA with patches, LAI obs –
   planned and ongoing
Code cleaning:
   for better optimization

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R&D: Soil and vegetation, DA

- **in ver:** … discussions about DA for ISBA-DIF

- **in hor:** EURO4M - finished
- Prototype of En2DVar as OI replacement
- Improved OI with empirical non-isotropic and inhomogeneous structure functions: MESCAN
- Experiments with MESCAN and SURFEX

… to be continued

R&D: Snow modeling

MEB (coupled with ISBA-DIF, climate mode):
- extensive offline testing: over Europe comparing with ISBA-FR (difference in Southern Europe) ; validation against the Soviet snow dataset
- 1D experiments for Sodankylä: tuning of parameters, validation of SWE and fluxes
- first inline experiments in HARMONIE
- officially in SURFEXv.8, MEB+ISBA-FR

- planned

CROCUS: used for avalanches and snow drift on roads in Iceland (SNAPS project) and in Norway

http://www.snaps-project.eu/

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R&D: snow DA

in hor:
- experiments using probability of snow from satellite ....
- SE obs from NESDIS are too smooth for HARMONIE
- SE from Land-SAF, or Globsnow, or MODIS, SWE from microwave retrievals using HUT model - planned
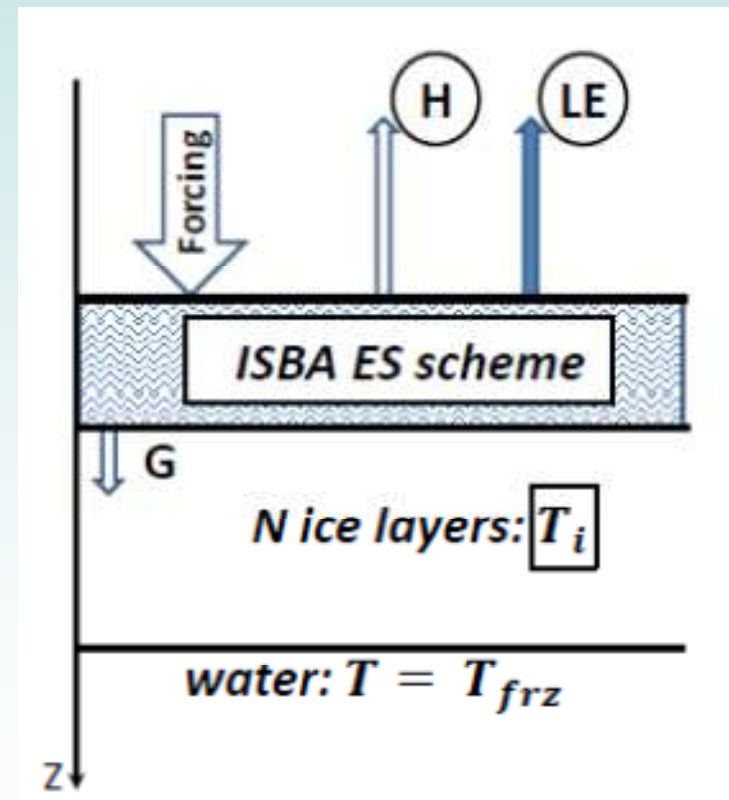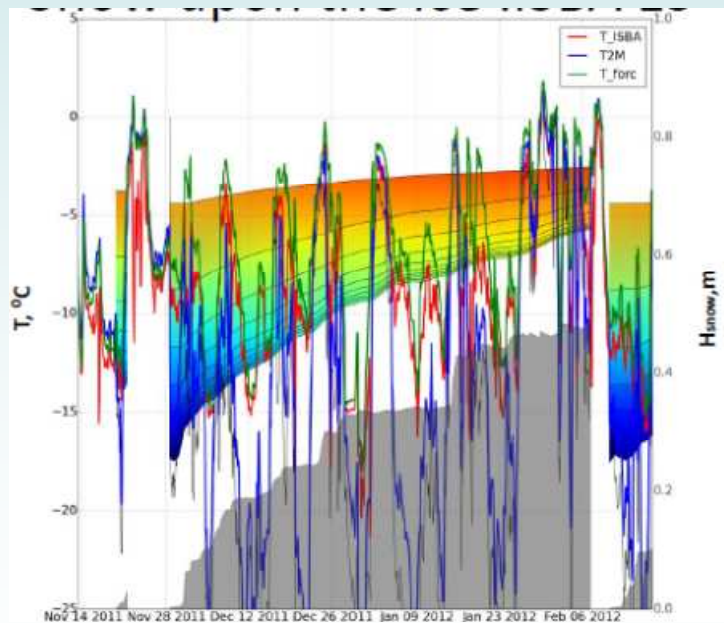
in ver: EKF for SWE – planned, ideas how to assimilate SAR data
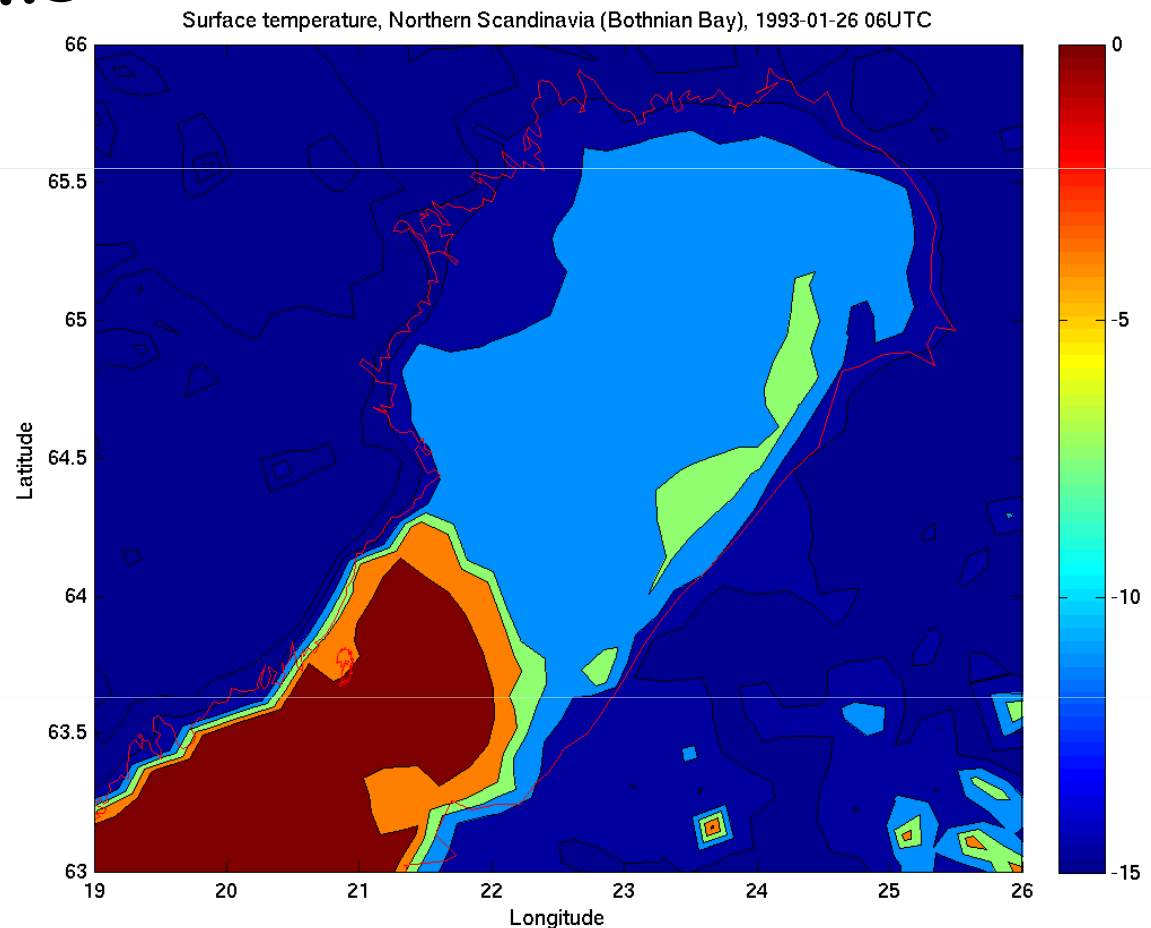
Snow obs and DA COST Action!

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R&D: Sea ice modeling

- **Simple ice scheme** (H=1m, heat diffusion 4L), snow on ice 4L, the ice fraction from analysis, offline and inline tests
- **HIGHTSI** – planned and ongoing

R&D: Sea ice modeling

- **Simple ice scheme** in the climate version of HARMONIE

Surface temperature, Northern Scandinavia (Bothnian Bay), 1993-01-26 06UTC

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R&D: Lake modeling

- to test FLake in 2D, SURFEX7.3, 7.2, HARMONIE 38-40 – planned and ongoing
- to include new versions of the lake database and lake climatology into SURFEX and HARMONIE – planned
- 1D experiments for Lake Kyyvesi: to study the model error during different seasons
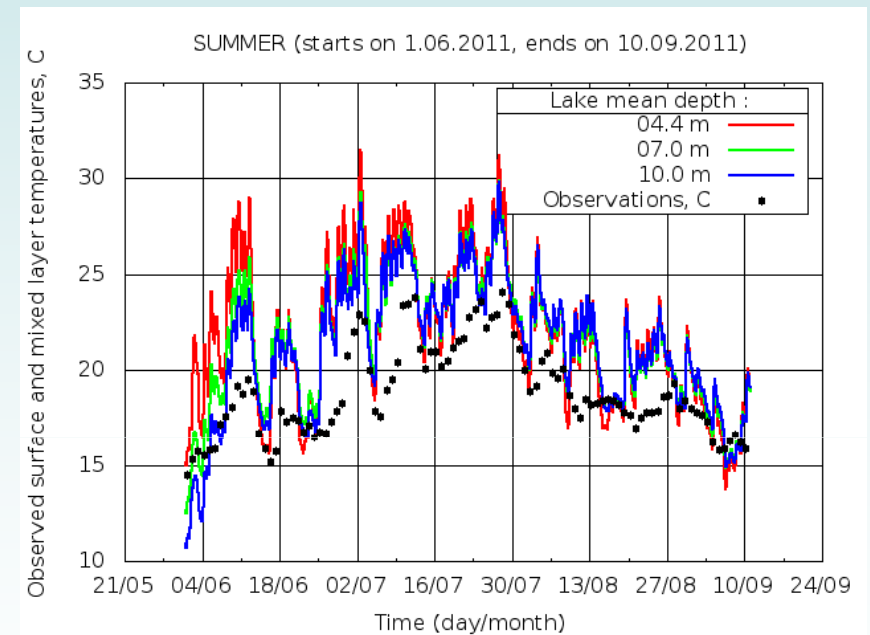
R&D: Lake DA

- **In hor:** new structure functions for OI (different from SST), quality control of satellite data – planned and ongoing
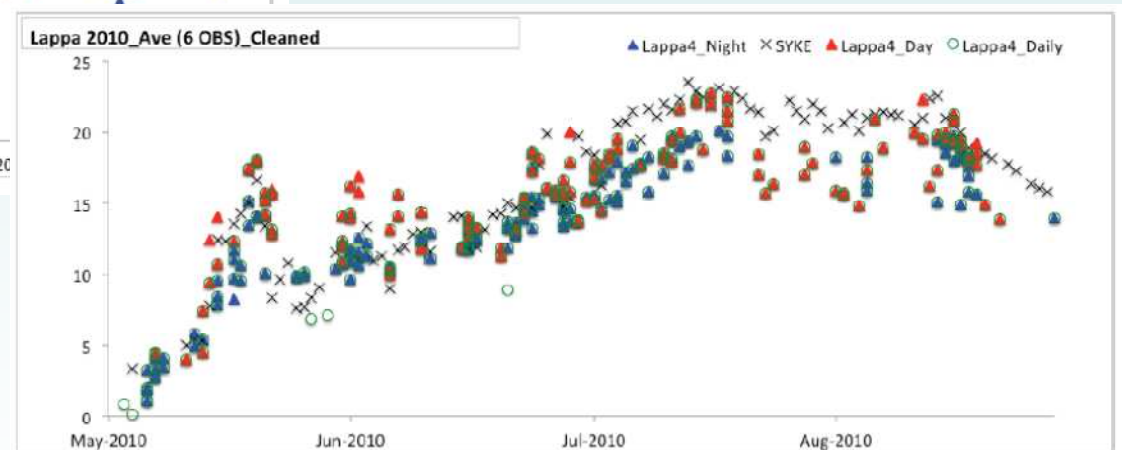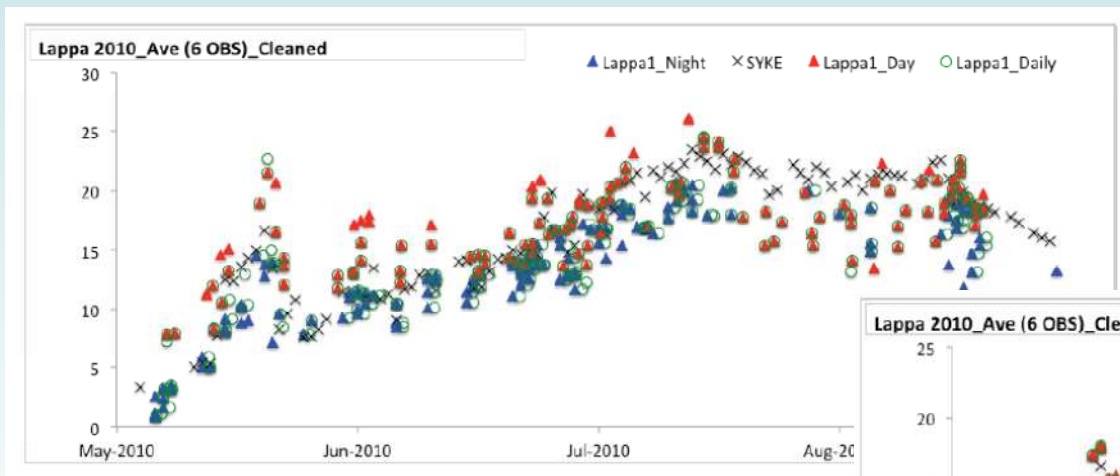
R&D: Lake DA

- **In ver:**

  - A posteriori statistics, statistics of errors, bug fixes
  - Testing with deep water temperature obs, include into SURFEX and HARMONIE - planned

Name (longitude, latitude)	D (m)	I (%)	Name (longitude, latitude)	D (m)	I (%)
Kuivajärvi (23.9, 60.8)	2.2	94.8	Rehja-Nuasjärvi (28.0, 64.2)	8.5	95.5
Tuusulanjärvi (25.1, 60.4)	3.2	94.3	Vaskivesi (23.8, 62.1)	7.0	97.1
Pääjärvi 1 (24.5, 62.9)	3.8	96.6	Haukivesi (28.4, 62.1)	9.1	94.9
Pesiöjärvi (28.7, 64.9)	3.9	95.4	Kallavesi (27.7, 62.8)	9.7	96.3
Kyyvesi (27.1, 62.0)	4.4	96.5	Pielinen (29.6, 63.3)	10.1	94.6
Jääsjärvi (26.1, 61.6)	4.6	96.2	Konnevesi (26.6, 62.6)	10.6	95.4
Nilakka (26.5, 63.1)	4.9	96.6	Saimaa (28.1, 61.3)	10.8	94.5
Pyhäjärvi (22.3, 61.0)	5.5	96.4	Ala-Rieveli (26.2, 61.3)	11.2	92.4
Längelmävesi (24.4, 61.5)	6.8	94.4	Päijänne (25.5, 61.6)	14.1	93.7
Ounasjärvi (23.6, 68.4)	6.6	97.3	Inarijärvi (27.9, 69.1)	14.3	97.1
Lappajärvi (23.7, 63.1)	6.9	93.4	Näsijärvi (23.8, 61.6)	14.7	94.0
Oulujärvi (27.0, 64.5)	7.0	95.0	Pääjärvi 2 (25.1, 61.1)	14.8	96.7
Unari (25.7, 67.1)	7.0	94.0	Kilpisjärvi (20.8, 69.0)	19.5	96.8
Kevojärvi (27.0, 69.8)	7.0	98.0			

(Hir lam)

R&D: Urban modelling

Intercomparison study
- TEB in SURFEX
-SUEWS (U Helsinki)
-CLM-U (KU Leuven)
year 2012, SMEAR III tower at suburban area
and Hotel Torni at Helsinki city centre

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R&D: orographic radiation parametrization

in progress

Timeline and outook

- Obtain the fine resolution source data (SRTM) for the Austrian domain ✓

- Create a wiki page for information transfer https://hirlam.org/trac/attachment/wiki/ororad/ ✓

- Calculation of necessary orographic parameters (GDAL tool, scripts) — Partially done May 2014

- Adaptation of parameters to model resolution with PGD — Stay at MeteoFrance Sep., Oct. 2014

- Implementation of radiation calculations in/before SURFEX call

- Study the sensitivity and validate the parameterization — Autumn 2014

- Reporting and publication — Winter 2014/15

15.05.2014
Folie 7

ZAMG

Hirlam

R&D: Physiography

- **Evaluation of GLDBv2 vs GLDBv1**: independent data in Finland, the lake depth bias decreased from 5.36m to 2.64m

- **Towards GLDBv3**: indirect estimates of the mean lake depth for the Sourthern Hemisphere
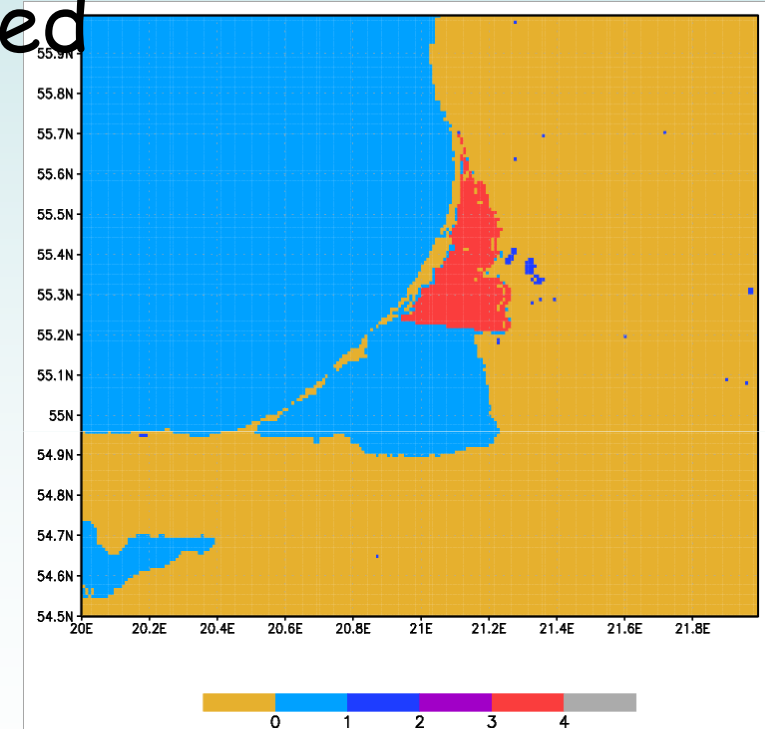
- To include into SURFEX, HARMONIE - planned

in progress

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R&D: Physiography

- Philosophy of fractions of tiles within Covers
  => inconsistency problems with other
  datasets, such as lake database.
  Solution: don't use this approach for lakes.
- Some Covers are poorly defined
  Solution:
  to fix the binary cover map,
  done, should be coordinated
  with other developments

*Curonian lagoon, Covers types contain
from 2 to 50% of land*

Thank you!