Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology MeteoSwiss

pheno4cosmo workshop

Andreas Pauling, Jean-Marie Bettems

Zurich, 21.2.2017

The topic

- Currently, LAI climatology is used in COSMO (based on sine-curve)
- In European spring, LAI can vary substantially depending on the weather
- LAI influences transpiration and latent heat flux and thus temperature and many more variables

- Main question to be answered :

  What is the sensitivity of COSMO to LAI changes?

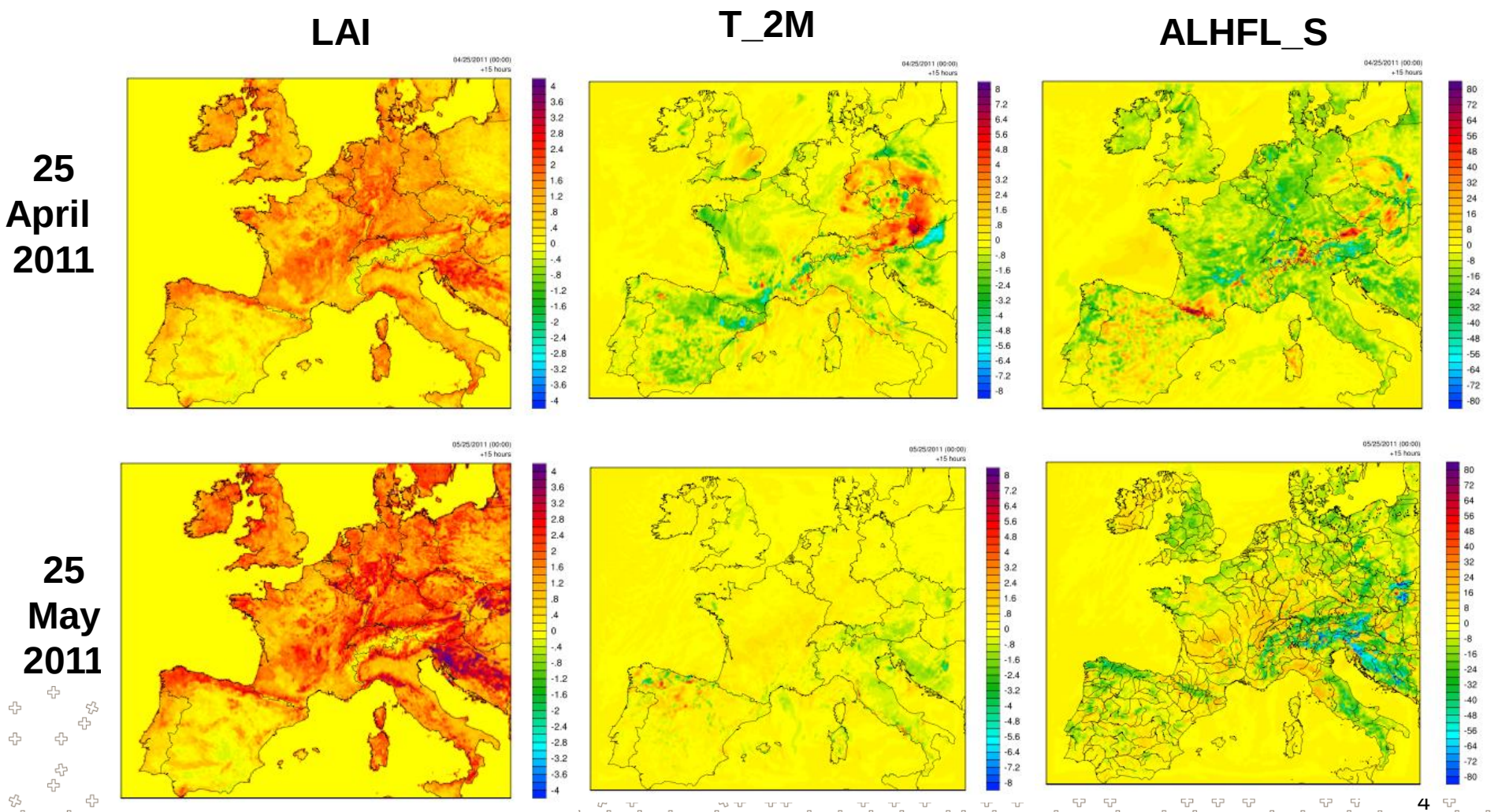
The experimental design

- Reto's phenology model provides daily LAI maps (based on MODIS data with Ensemble Kalman Filter)

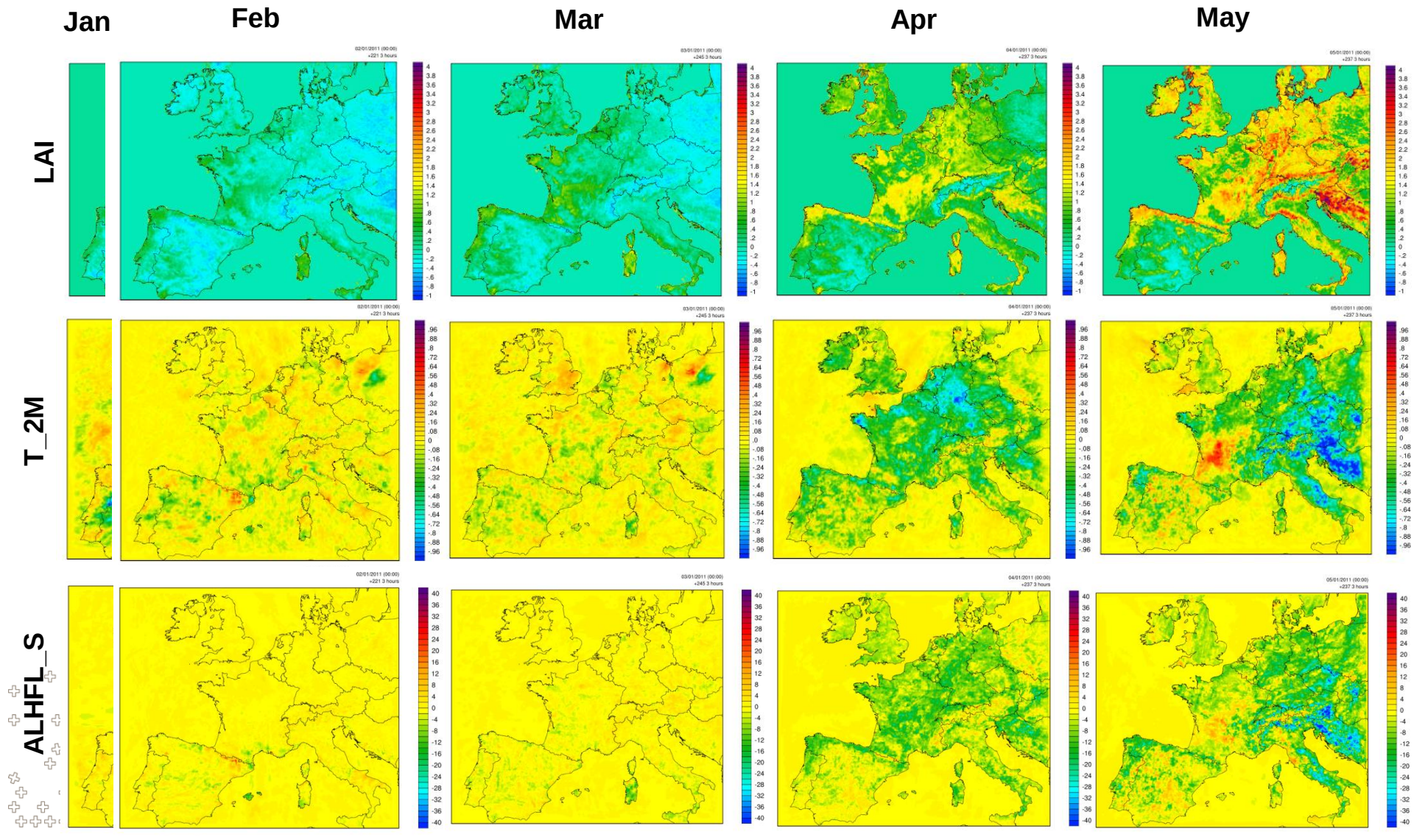
- 2 parallel runs with COSMO-7 restarted every 24 hours with fresh start field from the archive over the period 15 Jan 2011 – 30 May 2011 (very warm and early spring)
  - 1 reference run with operational (climatological) LAI
  - 1 experimental run with Reto's LAI merged every 24 hours

  $\Rightarrow$ 2 parallel runs with only difference LAI
  => many variables available, focus in T_2M and ATHFL_S, could look at any…

daily 15h UTC values exp minus ref (Examples)



monthly means of daily 15h UTC values year 2011. exp minus ref



Conclusions and Outlook

What is the sensitivity of LAI changes in COSMO?

=> 1 K / 4 LAI. large-scale feature. This is what we can expect in extreme years.

=> 40 Wm^{-2} / 4 LAI.

- Could year-specific LAI improve the performance?
- Comparison with operational verification

  => need to: merge fields like SSTs and snow mask and calculate whole period again.

3 Action points bis Juni 2017 (paa)

1. Experimental run starten mit Felder aus Vorlauf (Austausch von LAI und SSTs), damit die Feedbacks (z.B. Bodenfeuchte) mitgenommen werden
   => Vergleich mit Reference run
2. Standardverifikation für Mai 2011 gegen Synop T_2M mit neuem Feedback-Lauf => osm-Unterstützung
3. 2011 auch mit Sommer und Herbst rechnen um die Sommerstressfaktoren (Temperaturen, Feuchte) Herbstphänologie (Blattverfärbung,…) auch drin zu haben.

Falls Verifikation viel versprechend, wäre es gut, die obigen Analysen auch für ein spätes Jahr (z.B. 2013, Reto müsste noch den LAI rechnen) zu machen

Other mid-term actions

1. It is useful to continue to work on this topic (large sensitivity of COSMO to LAI).
2. The two major technical tasks for operational use of the prognostic phenology scheme are:
   - transfer the phenology model from TERRA offline to the latest fully coupled model (involves new I/O fields and new prognostic variables)
   - translate PFTs to COSMO land use classes (GLOBCOVER)
   - Estimated working time: 3 months for first bullet, one month for second bullet (for someone who knows TERRA…)