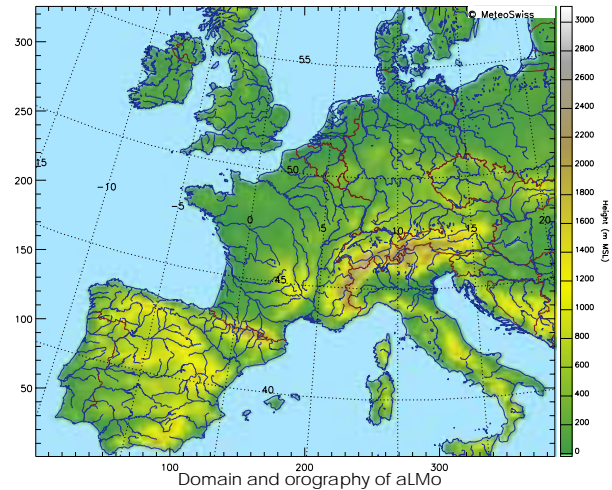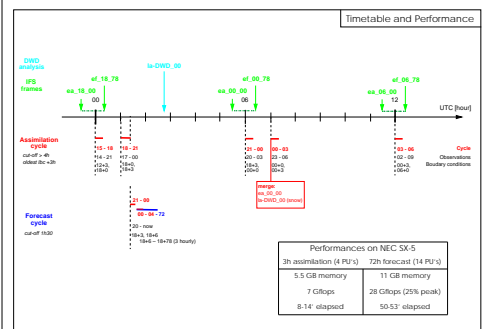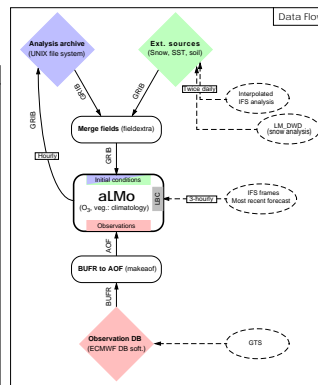# The Alpine Model (aLMo) in Switzerland

- **Swiss implementation of the COSMO-Model**
  non-hydrostatic, fully compressible

- **prognostic variables**
  pressure, 3 wind components, temperature,
  specific humidity, liquid water content

- **initial conditions**
  newtonian relaxation (nudging) to the observations

- **two 72h forecasts per day**
  boundary conditions every 3h from ECMWF global model IFS

- **operational since 2001 with GME, since Sept. 2003 with IFS**
  on NEC SX-5 at the Swiss Center for Scientific Computing, CSCS

- **rotated longitude and latitude grid resolution:** 1/16˚~ 7km

- **vertical coordinate**
  45 generalized terrain-following pressure based levels

- **domain**
  385 x 325 x 45 = 5'630'625 grid points

Domain and orography of aLMo

Data Assimilation

Assimilated observations

Data Flow

Timetable and Performance

| Performances on NEC SX-5	
3h assimilation (4 PU's)	72h forecast (14 PU's)
5.5 GB memory	11 GB memory
7 Gflops	28 Gflops (25% peak)
8-14' elapsed	50-53' elapsed

Experiments with GPS data
Integrated Water Vapour (IWV) OSE in June 2002

In the framework of the COST action 716, a serie of Observing System Experiments (OSE) was conducted with aLMo. About 100 GPS sites were used for 3 selected periods in autumn 2001, winter and summer 2002.

Fig. A:
Integrated water vapor amount in kg/m^2 at Payerne from the near real time GPS data (blue line), post-processed GPS data (green line), aLMo reference analysis (black line) and aLMo GPS analysis (red line). Note the good agreement between near real time and post-processed GPS data, except 2-3 events which are smoothed out by the near real time processing. Also note the episodes with large discrepencies between observations and aLMo reference which are mainly corrected by assimilating GPS data.

Fig. B-D:
Six hour accumulated precipitation from 0 to 6 UTC on 20 June 2002 from:
B: aLMo reference forecast, C: aLMo GPS forecast, D: radar observation
The forecasted intense precipitation over Jura region (i.e. north-western Switzerland) in the GPS experiment is confirmed by the radar.

Reference:
Guerova G., J.-M. Bettems, E. Brockmann and CH. Mätzler, 2003: Assimilation of COST 716 Near Real Time GPS data in the nonhydrostatic limited area model used at MeteoSwiss,
Submitted to Meteorology and Atmospheric Physics.

Fig. A

Fig. B

Fig. C

Fig. D
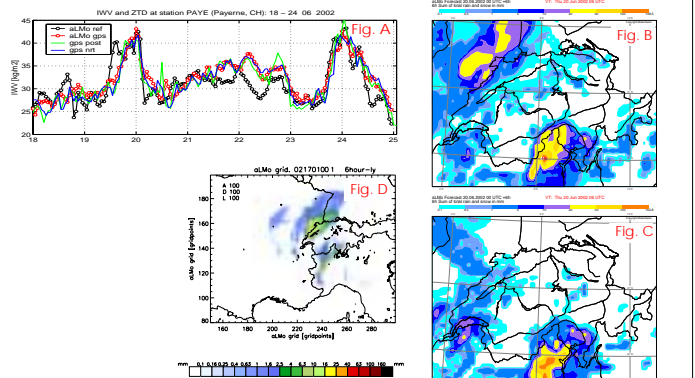
Outlook

- prognostic cloud ice
- prognostic precipitation & 2 TL scheme
- prognostic TKE
- new terrain following coordinate (SLEVE)
- Kain-Fritsch convection scheme

- derivation of surface parameters from NOAA & MSG

- very high resolution O (1km) experiments
- latent heat nudging with radar data
- dynamical downscaling of ECMWF EPS

For more information see:
www.meteoswiss.ch, www.cosmo-model.org, www.cscs.ch

MeteoSwiss