Numerical Weather Prediction at IMGW-PIB

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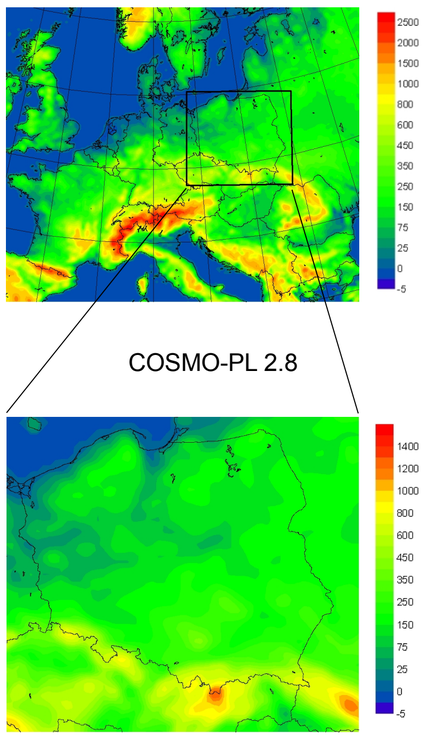
Status of operational suite & Computing system

Horizontal Grid Spacing [km]	7	2.8
Domain Size [grid points]	385 x 321	285 x 255
Time Step [sec]	40	20
Forecast Range [h]	78	36
Initial Time of Model Runs [UTC]	00 06 12 18	00 12
Model Version Run	4.08	4.08
Lateral Boundary Conditions	Interpolated from GME at 3h intervals	Interpolated from COSMO-PL 7
Initial State	Interpolated from GME	Interpolated from COSMO-PL 7
Data Assimilation	Nudging scheme	none
Prognostic Variables	U, V, W, T, P, PS, Q_V, Q_C, Q_I, Q_{VS},TKE	U, V, W, T, P, Q_V, Q_C, Q_I, Q_{VS}, TKE

COSMO-PL 7



- HP Bl460c - 32 blades in 2 racks c7000 - LINUX CLUSTER controlled by 2 managing servers.
- Every blade contains 2 4-core 16 GB processors Intel Xeon X5570.
- Blades interconnected with InfiniBand 4xQDR.
- Computing power above 2,5 T FLOPS.
- Cluster with 2TB storing volume connected with NetApp disks via the Fibre Channel protocol.

Post-Processing – examples

Wave Watch III (WW3) – a sea wave model using output from COSMO-PL 7km

Decision Support System for Forecasters – an expert system to help forecasters to issue warnings or alerts

Forecast for Yachtsmen – predictions of wind speed and wind direction for selected water bodies

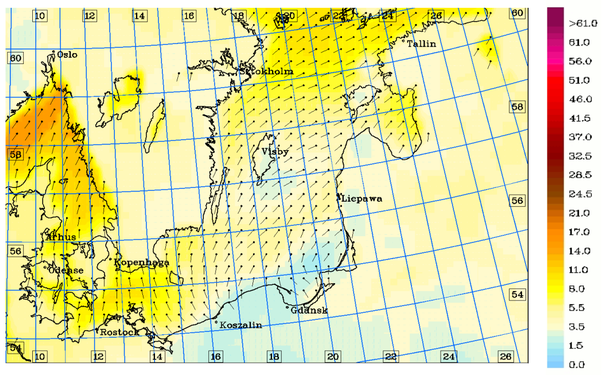
Dispersion model – predictions of air dispersion of volcano ashes using output from COSMO-PL 7km

Soaring forecasts – predictions of conditions for gliders using output from COSMO-PL 2.8km

Forecast for Yachtsmen

Wind Speed & Wind direction at 10m
COSMO PL, start 18.09.2012, 00 UTC
forecast 18.09.2012, 03 UTC (3h)

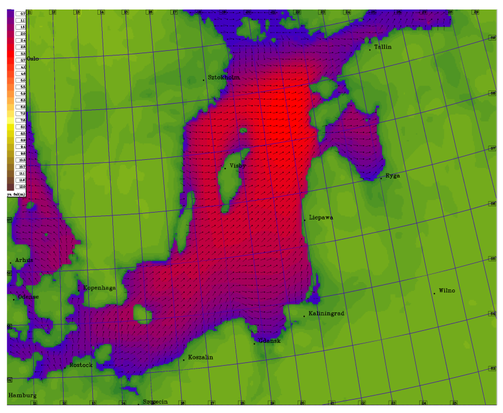
The Baltic Sea



Wave Watch III

Height & Direction of Sea Waves
COSMO PL, start 19.09.2012, 00 UTC
forecast 22.09.2012, 00 UTC (72h)

The Baltic Sea

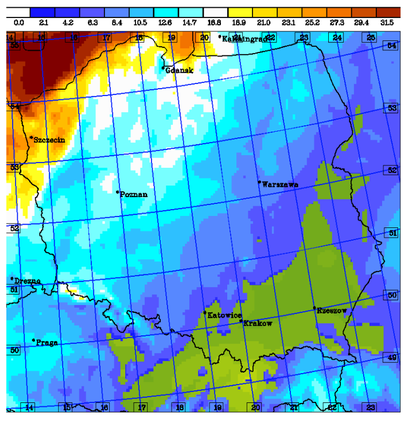


Decision Support System for Forecasters

The objective of the system is a selection of meteorological phenomena about which a user (forecaster) should be informed - in the meaning of decision support. The system includes results of NWP models, radar and satellite data. The variables taken into the system from COSMO Model: K-Index, CAPE Index, Lifted Index, Heavy Precipitation, Extremely High and Low Temperature, Wind gust, Freezing Rain.

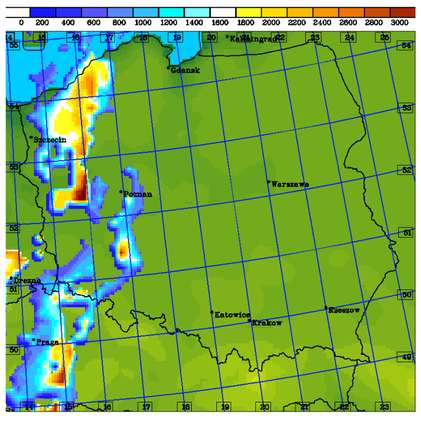
Wind Gust

COSMO PL, start 14.09.2012, 00 UTC
forecast 14.09.2012, 21 UTC (21h)



CAPE Index

COSMO PL, start 30.08.2012, 00 UTC
forecast 31.08.2012, 03 UTC (27h)



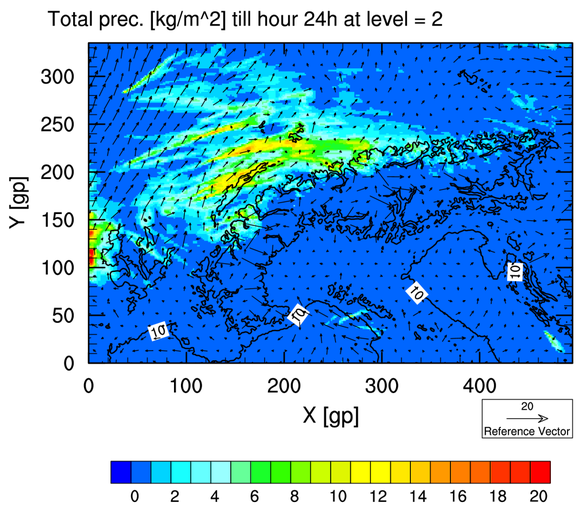
Research & Development

Conservative Dynamical Core (CDC) - COSMO Priority Project

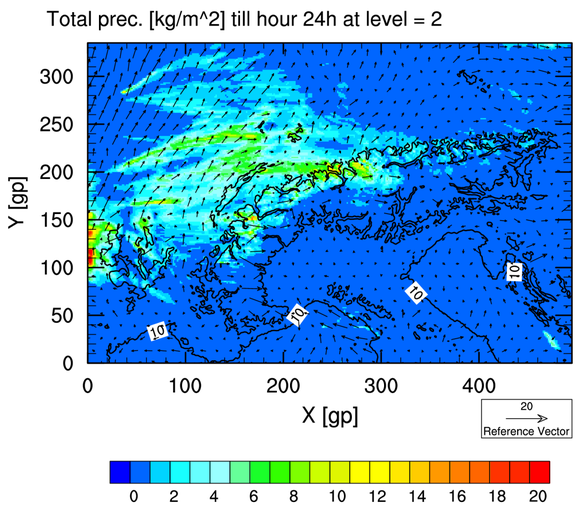
Comparison of realistic simulations of the Alpine flows performed with standard COSMO Runge-Kutta and EULAG dynamical cores using the same basic set of COSMO physical parameterizations

Setup of the experiment
Standard domain with 496 x 336 x 61 grid points and horizontal resolution of 2.2 km (similar to operational COSMO 2 domain of MeteoSwiss), initial, boundary conditions and orography as for operational COSMO 2. Physical parameterizations, used: TKE of sub-scale turbulence, moist microphysics, radiation (Ritter and Geleyn, MWR 1992), surface heat fluxes. Simulations start at 00:00 UTC, 12 November 2009.

COSMO - EULAG

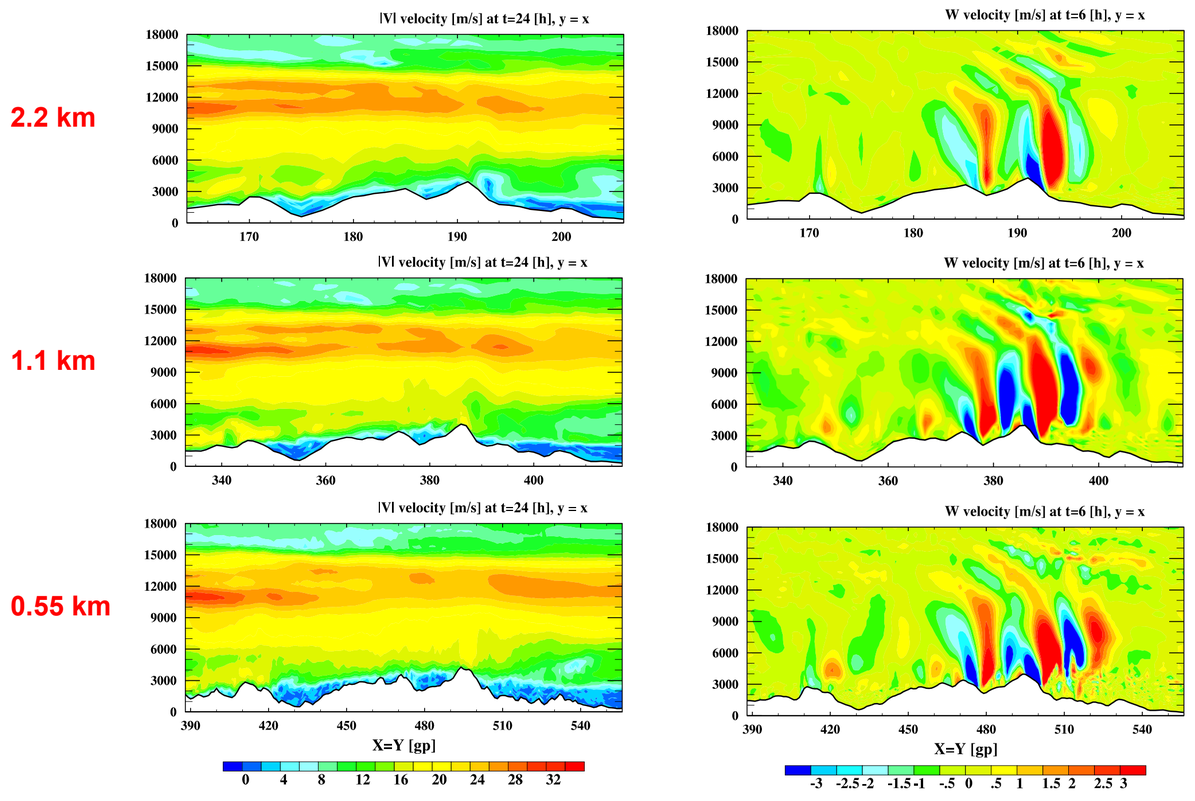


COSMO - RK



The results are in qualitative agreement. Anelastic approximation of EULAG did not result in significant differences between simulations. They preserve the evolution of the phase of the weather pattern indicating very similar flow field, as well as show generally similar precipitation structure.

Comparison of realistic simulations of the Alpine flows performed with EULAG dynamical core using the same basic set of COSMO physical parameterizations as above, but for horizontal resolution of 2.2, 1.1 and 0.55 km.



Numerically stable solution was obtained without a need for artificial smoothing. High resolution simulations introduce more variability and small-scale structures, as well as stronger influence of orographically induced gravity waves on the jet stream pattern.

Conclusions

- The CDC plan have been successfully completed.
- The main achievement of the project is the new stable version of the hybrid model (CE) in which the EULAG dynamical core is coupled with COSMO environment.

Future Plans

The aim of the follow-up priority project CELO is to fully integrate EULAG with COSMO framework, consolidate and optimize the setup of the anelastic EULAG dynamical core for the high-resolution NWP, optimize and tune the COSMO physical parameterizations, and test and exploit forecasting capabilities of the integrated model.