The effect of a non-envelope topography on deep convection

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2. Problems concerning convective precipitation
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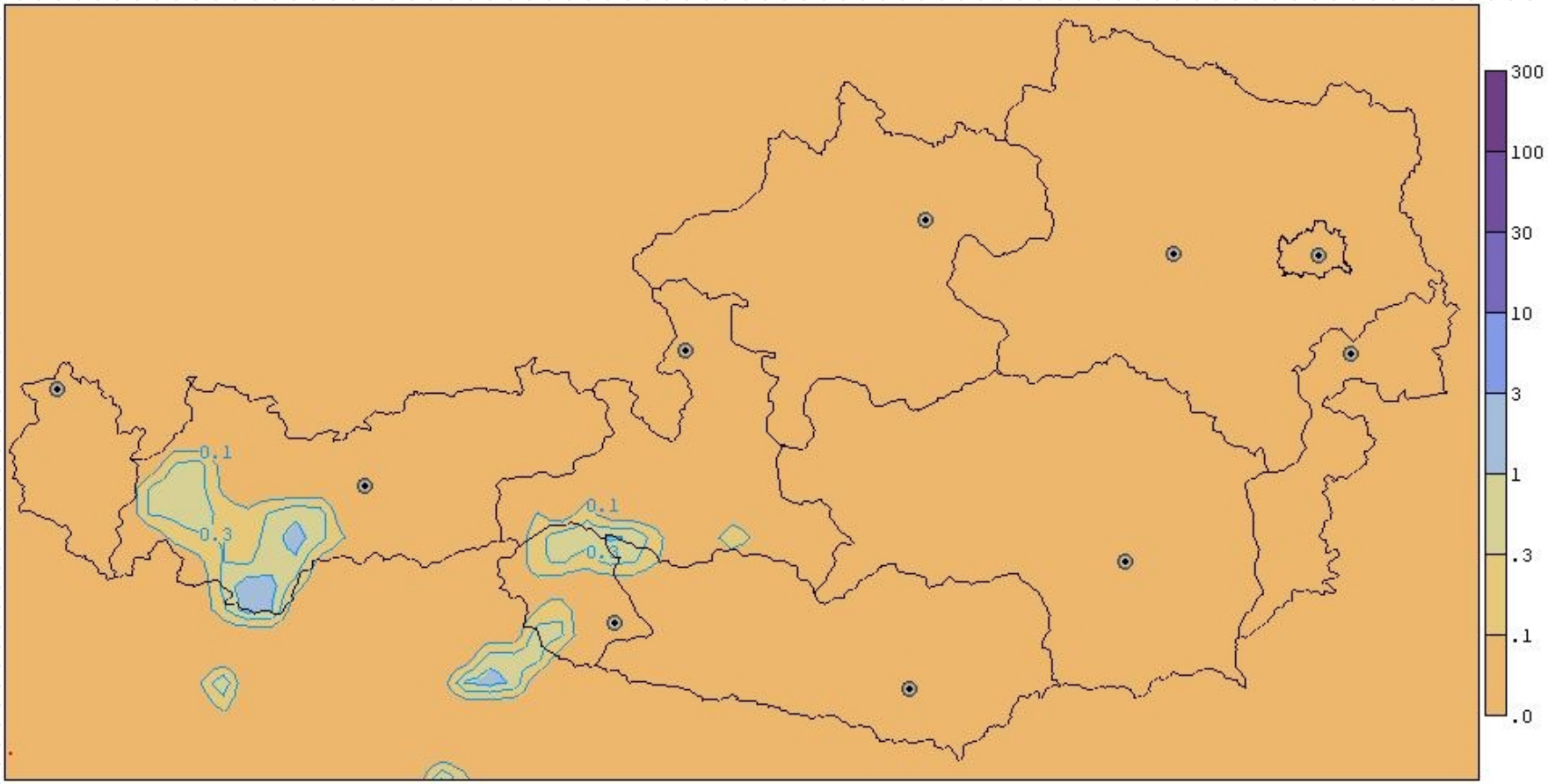
1. Deep convection scheme

- deep convection parameterization is only concerned with the precipitation amount, that can‘t be perceived by the large scale precipitation scheme.
- Arpege/Aladin uses the mass flux approach (Bougeault, 1985)
- deep convection needs grid-scale moisture convergence and positive bouyancy
- The convective precipitation scales with grid-scale moisture convergence
- Cloudiness is treated separately from the convective scheme, it is derived from the convective precipitation flux.

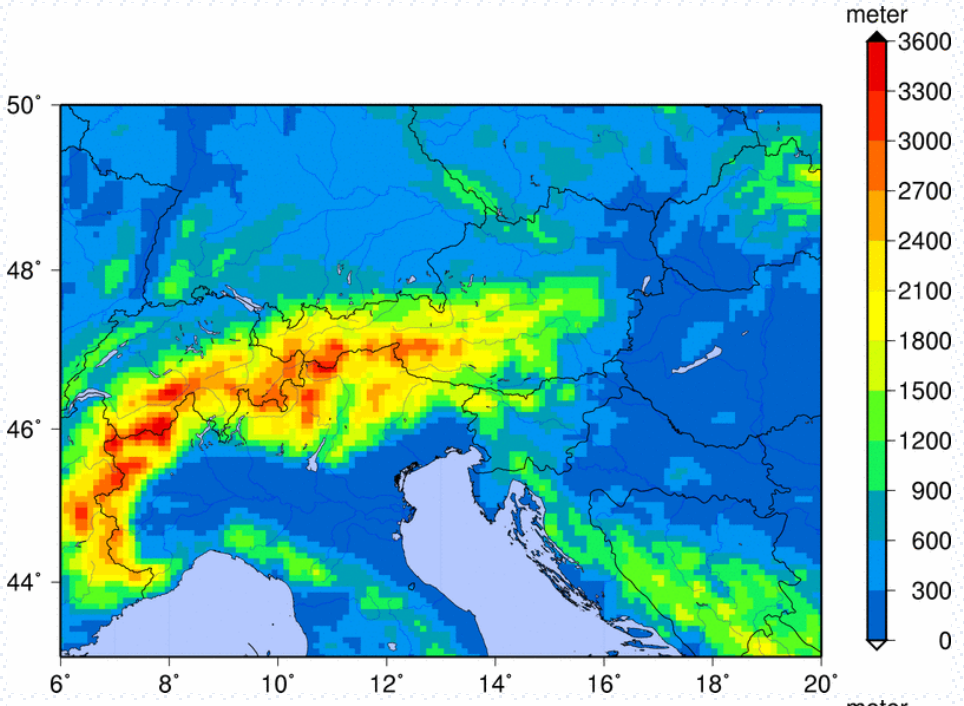
2. Problems

- Convective precipitation onset is too early
- Convective precipitation is too widespread
- Convective precipitation is too strongly tied to orographic features
- Intensities are too low
- Convective precipitation occurs too often

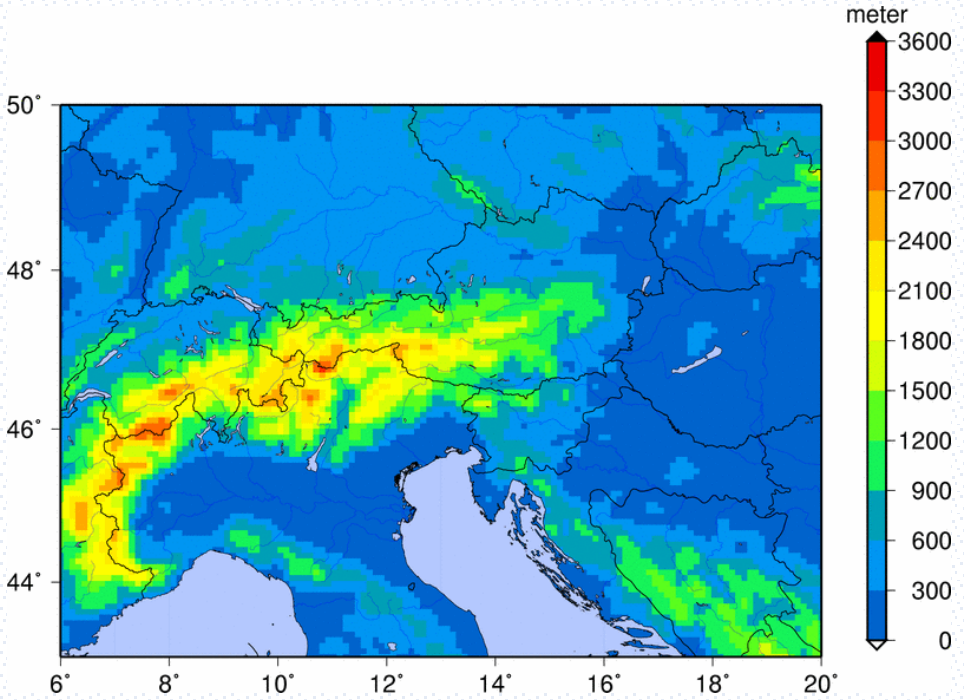
Cumulated convective precipitation, 00Z-18Z, 4.May 2003



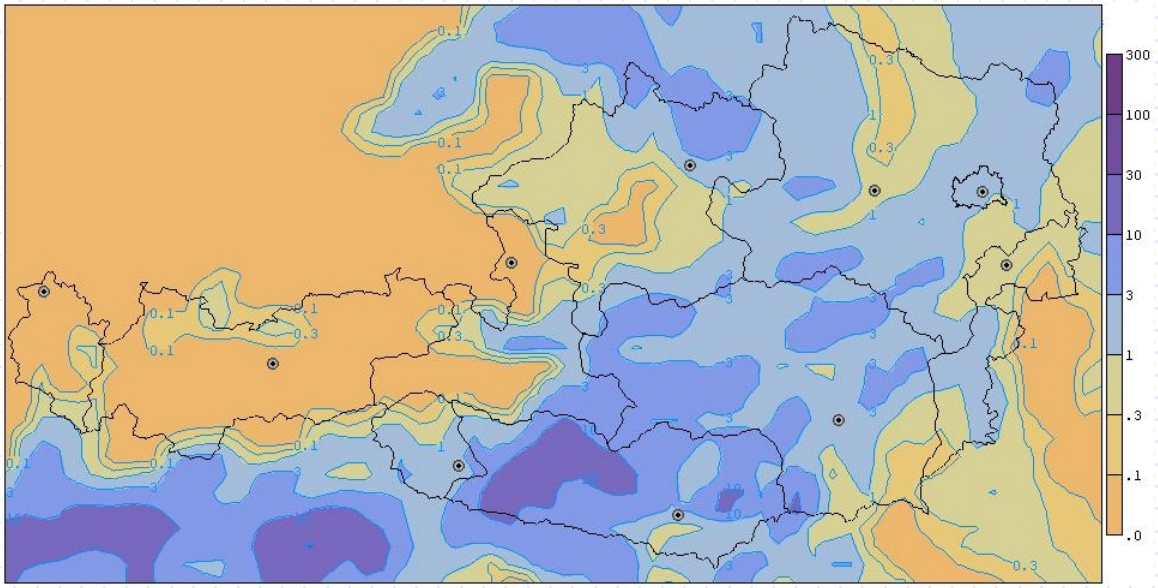
Aladin-Austria with
Envelope-topography



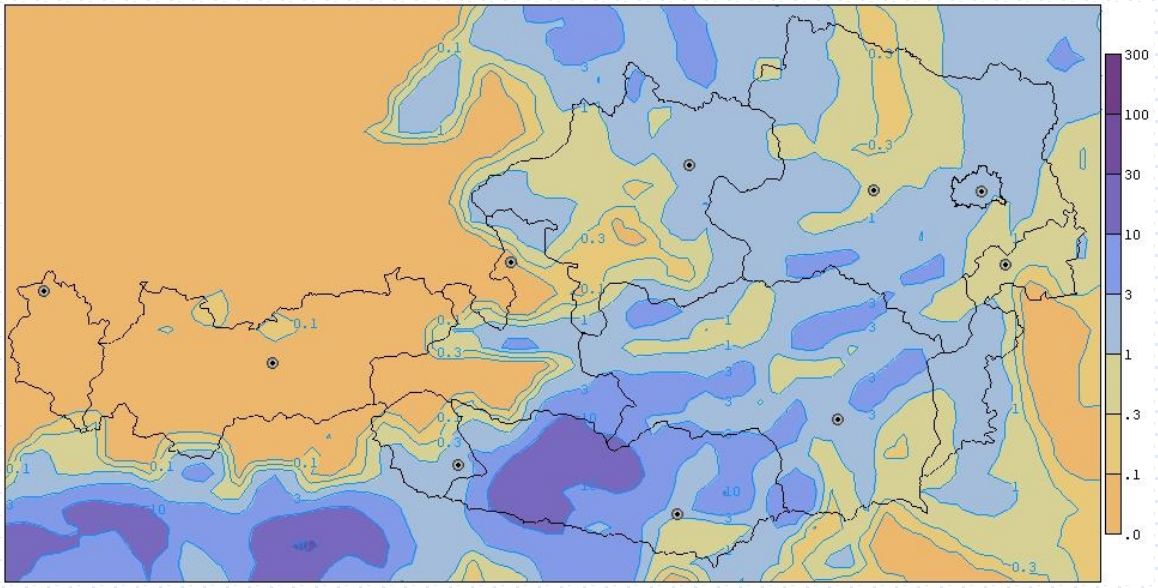
Aladin-Austria with
Mean-topography



Aladin-Austria non-envelope-topo with new acdrag-version (cumulated conv. prec.: 04.08.2003)



Aladin-Austria non-envelope-topo with operational acdrag

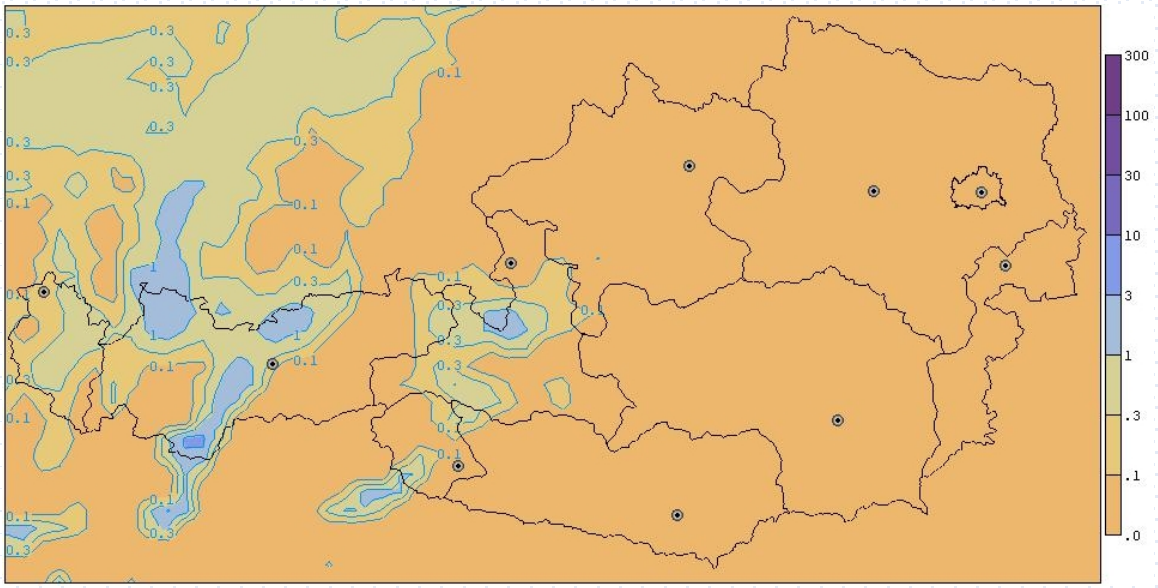


3. Case-studies

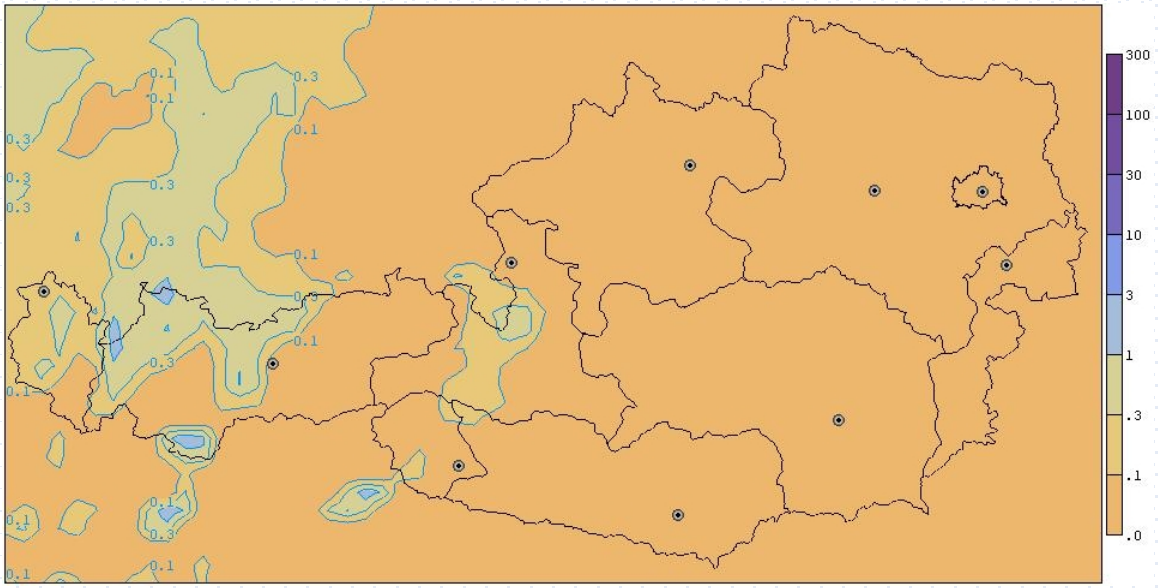
- Comparison Aladin-Vienna with and without envelope-topography
- Comparison Aladin-Austria with and without envelope-topography, Aladin-Vienna without envelope-topographie

Cumulated convective precipitation, 5th May, 2003

Aladin-Vienna
Envelope topography

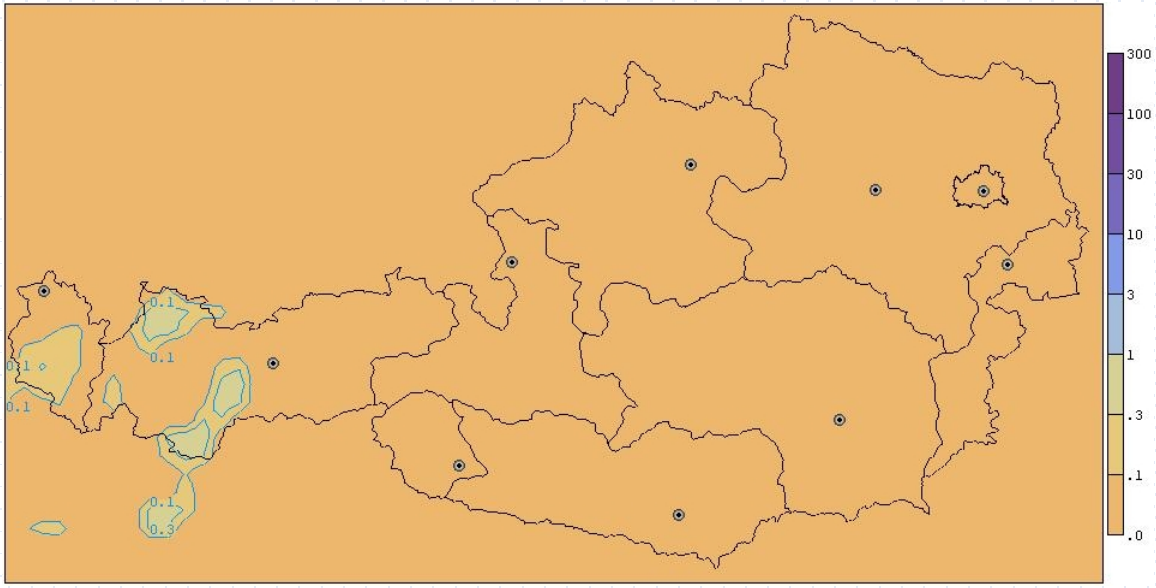


Aladin-Vienna
Non-envelope topography

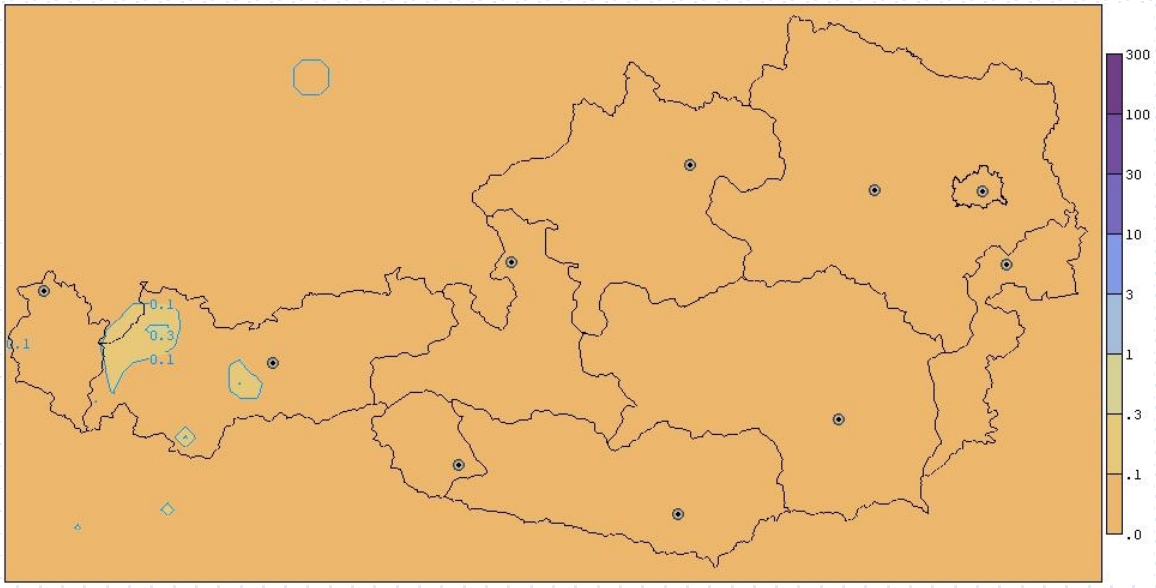


1h- precipitation rate, 5th May 2003, 12 UTC

Aladin-Vienna
Envelope topography

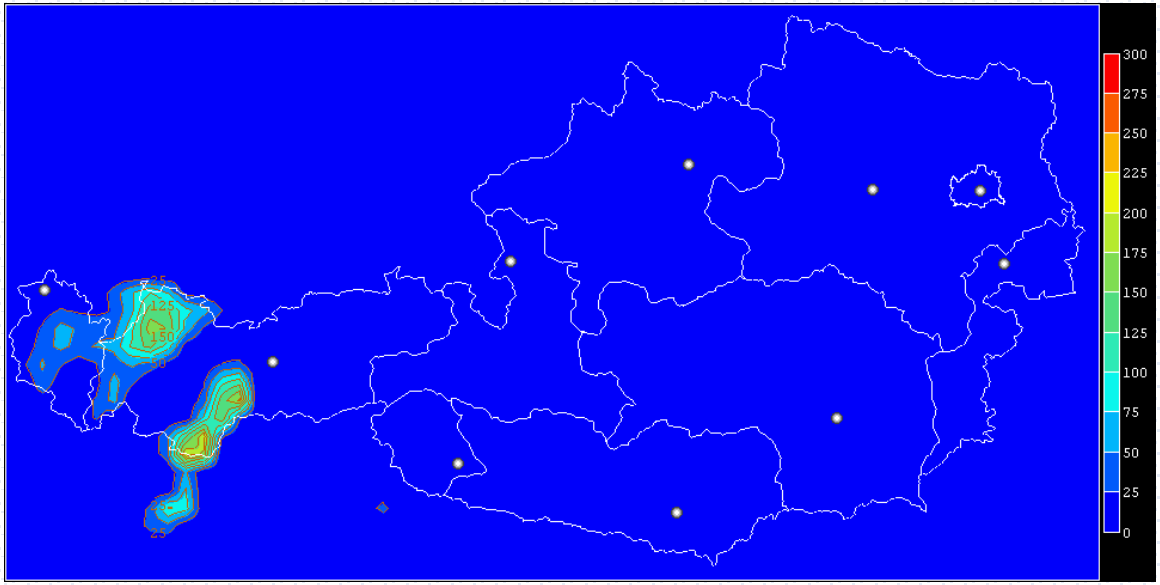


Aladin-Vienna
Non-envelope topography

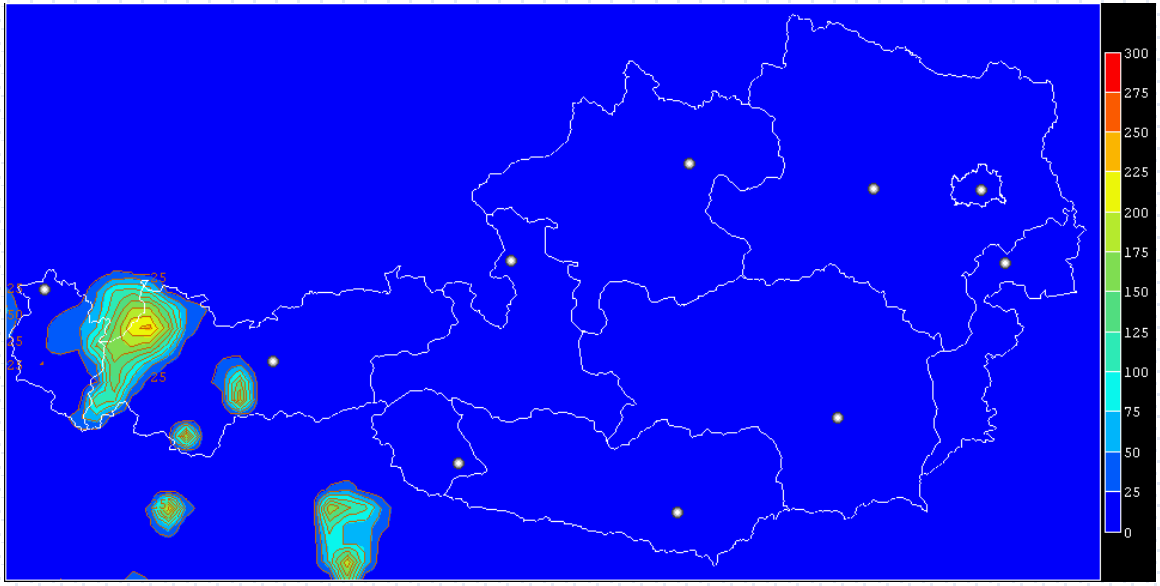


CAPE, 5th May 2003, 12 UTC

Aladin-Vienna
Envelope topography

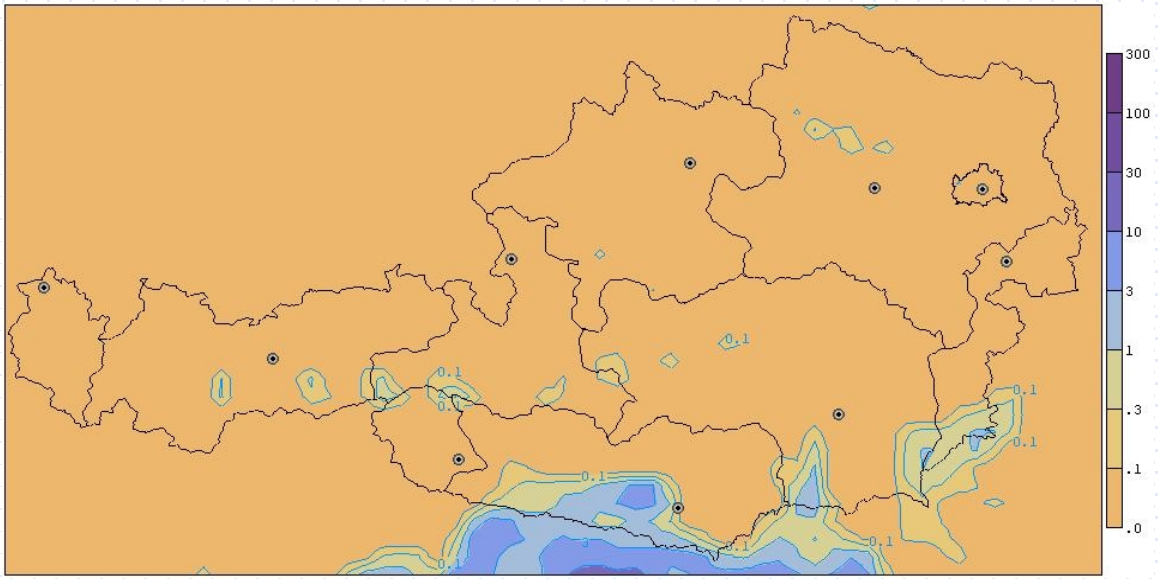


Aladin-Vienna
Non-envelope topography

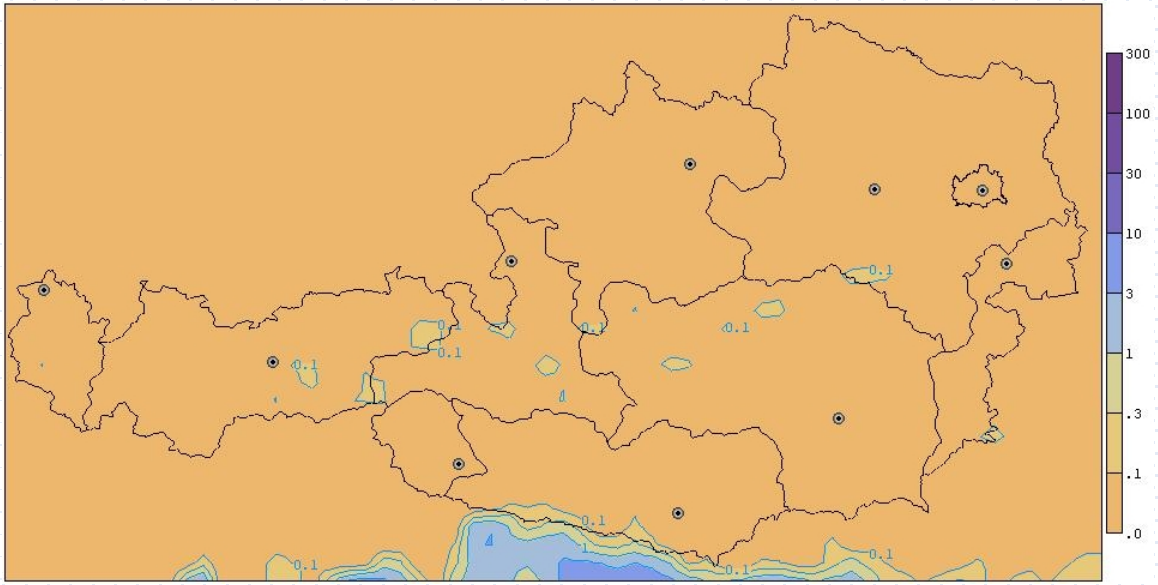


Cumulated convective precipitation, 21th June, 2003

Aladin-Vienna
Envelope topography

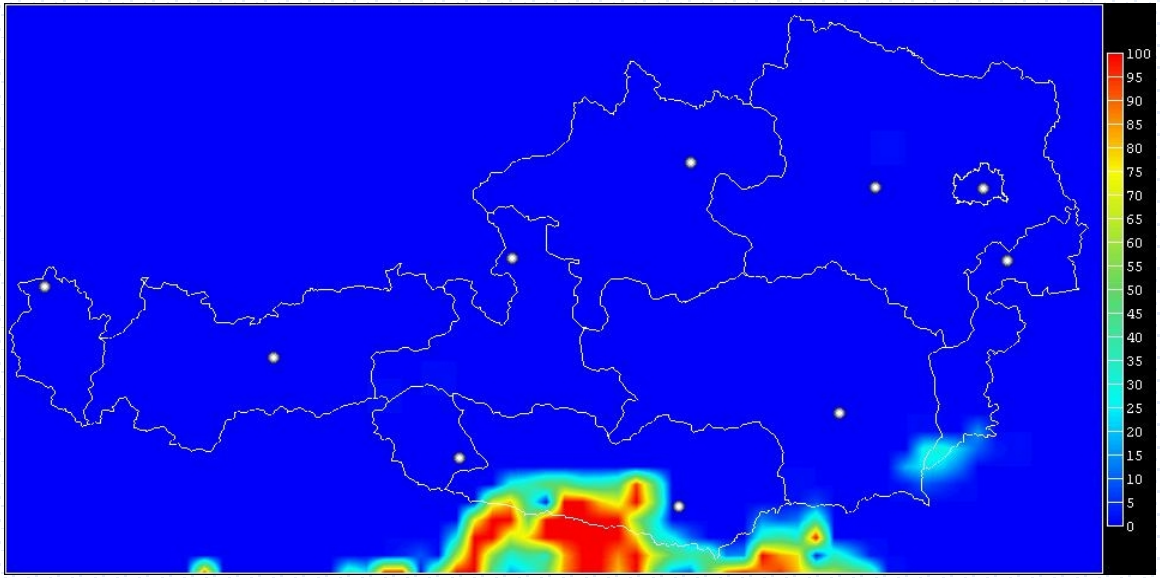


Aladin-Vienna
Non-envelope topography

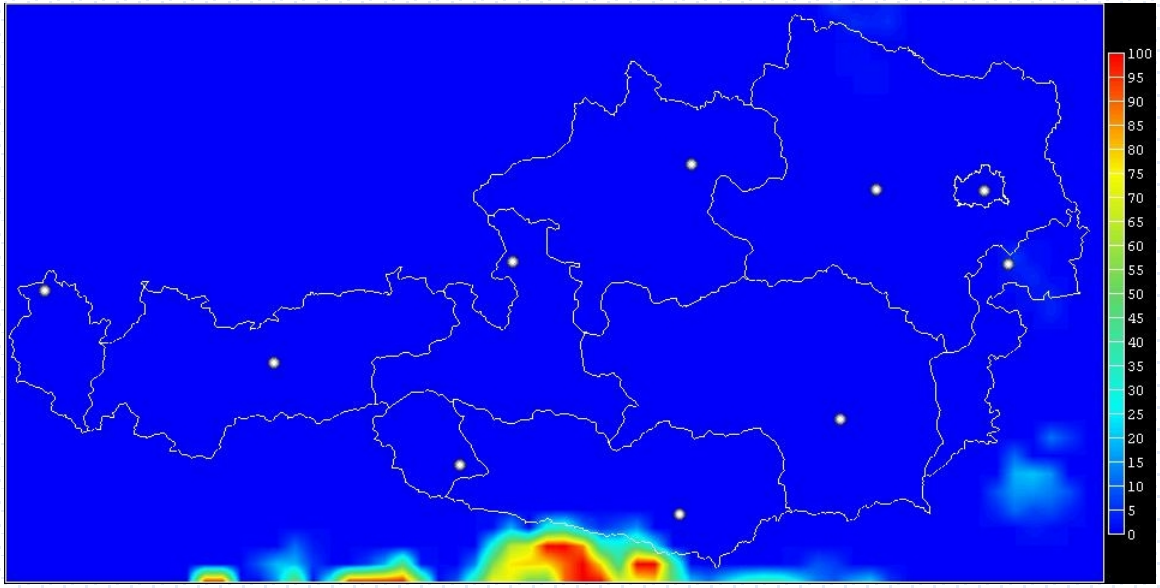


CAPE, 21th May 2003, 15 UTC

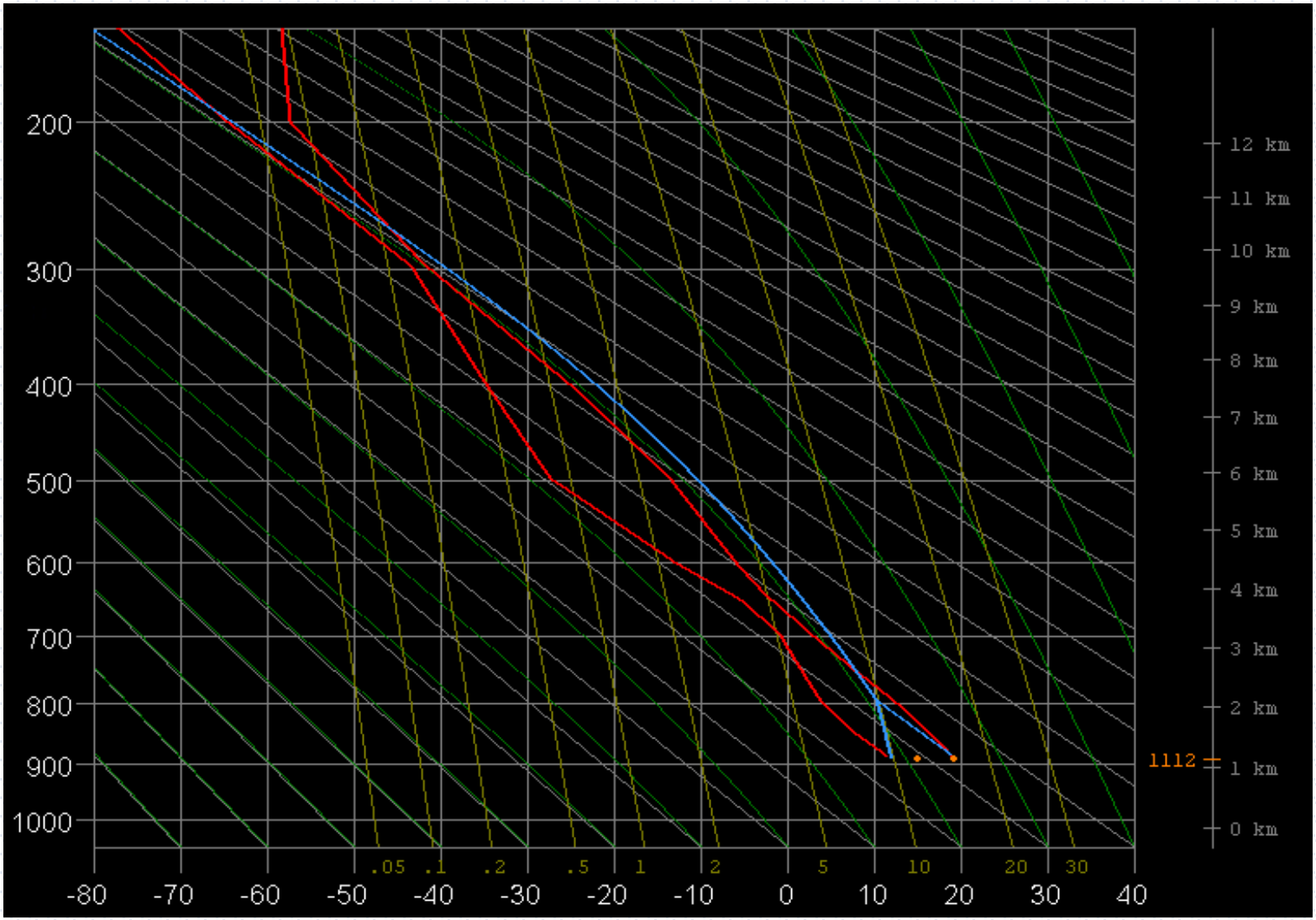
Aladin-Vienna
Envelope topography



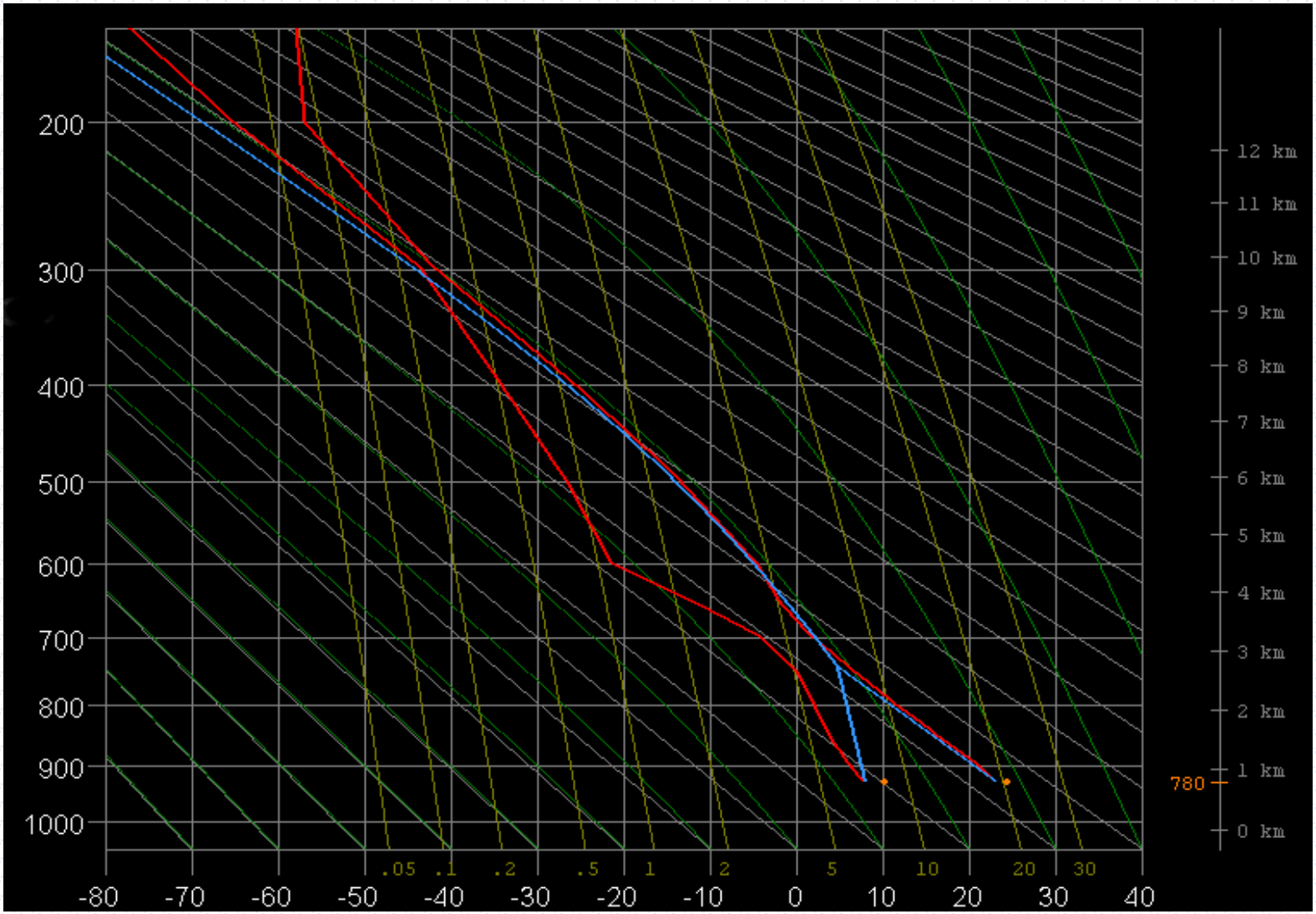
Aladin-Vienna
Non-envelope topography



Aladin-Vienna Envelope, 21th June, 2003, 14 UTC

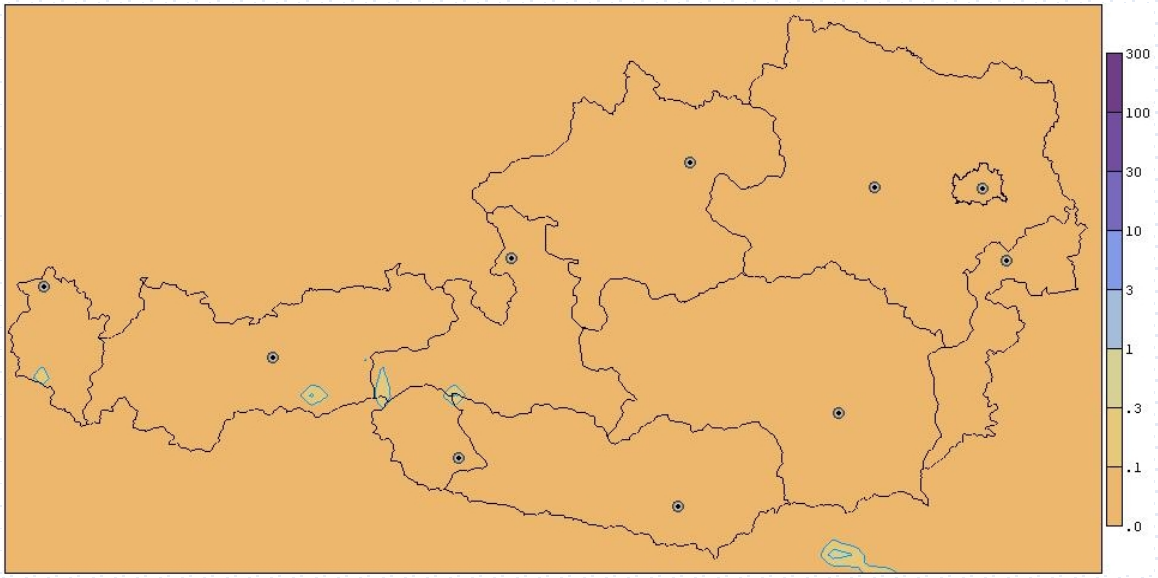


Aladin-Vienna Non-Envelope, 21th June, 2003, 14 UTC

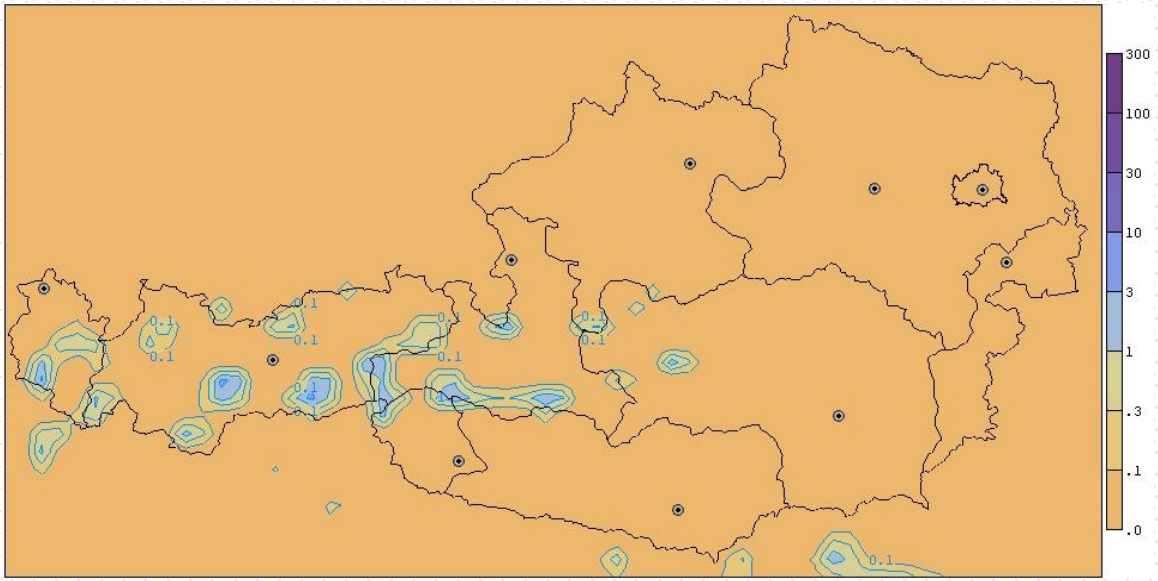


Overestimation of nighttime grid-scale precipitation

Aladin-Vienna
Envelope topography

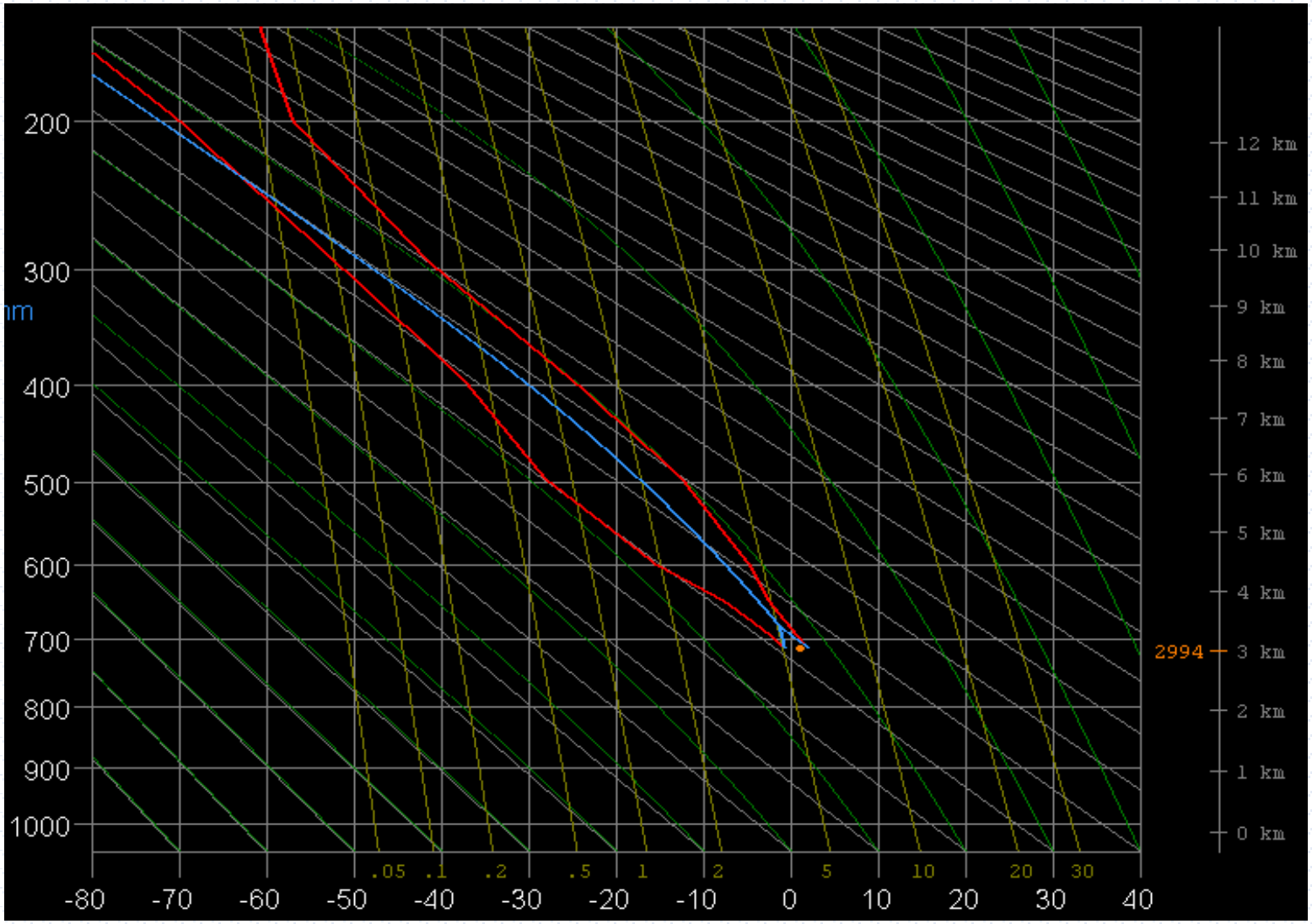


Aladin-Vienna
Non-envelope topography

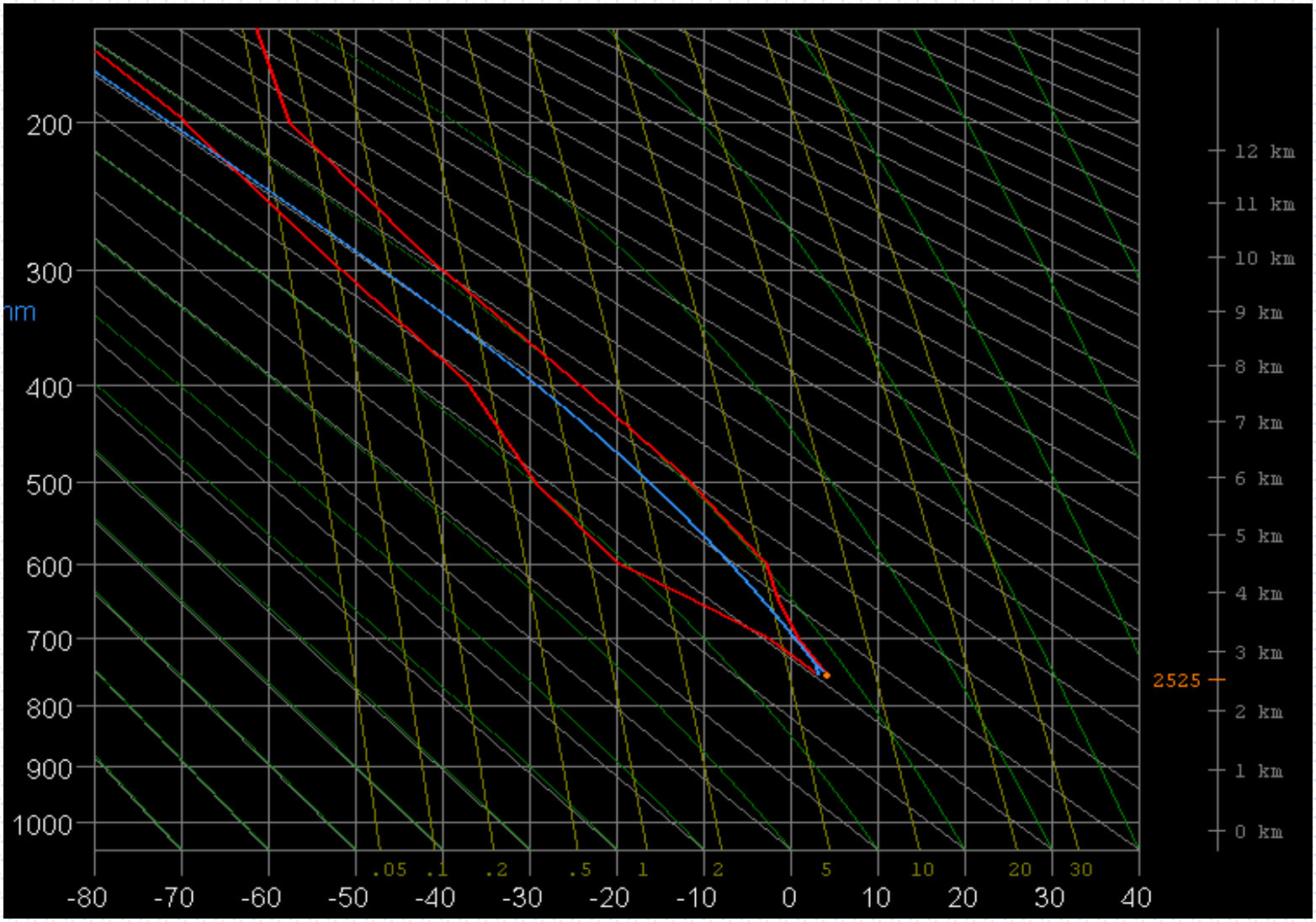


Cumulated grid-scale
precipitation, 0Z-6Z, 21th May

Aladin-Vienna Envelope, 21th June 2003, 02 UTC



Aladin-Vienna Non-Envelope, 21th June, 2003, 02 UTC

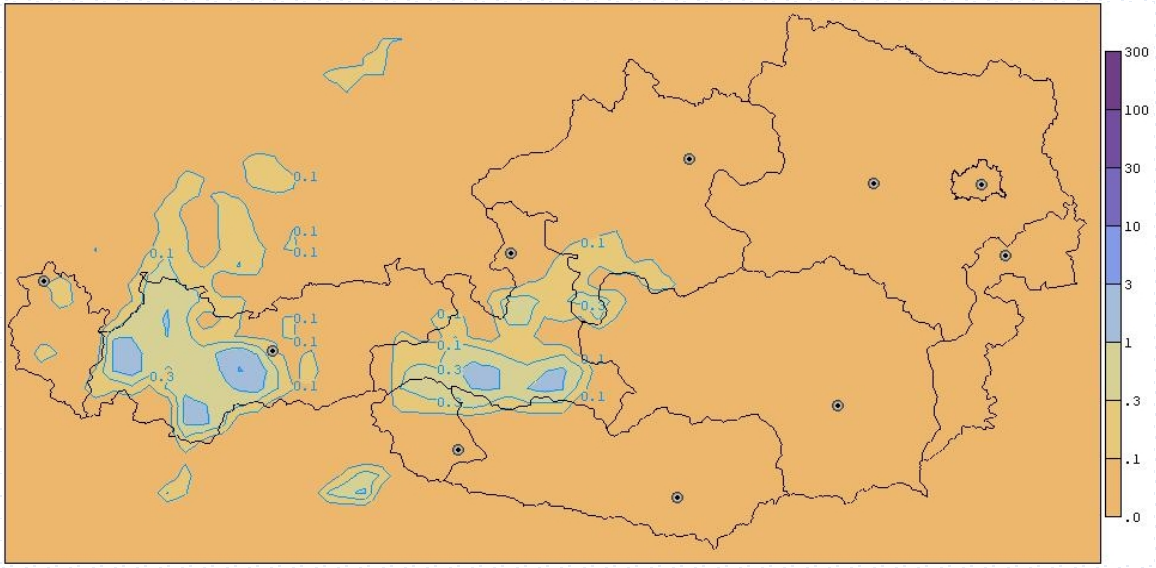


3. Case-studies

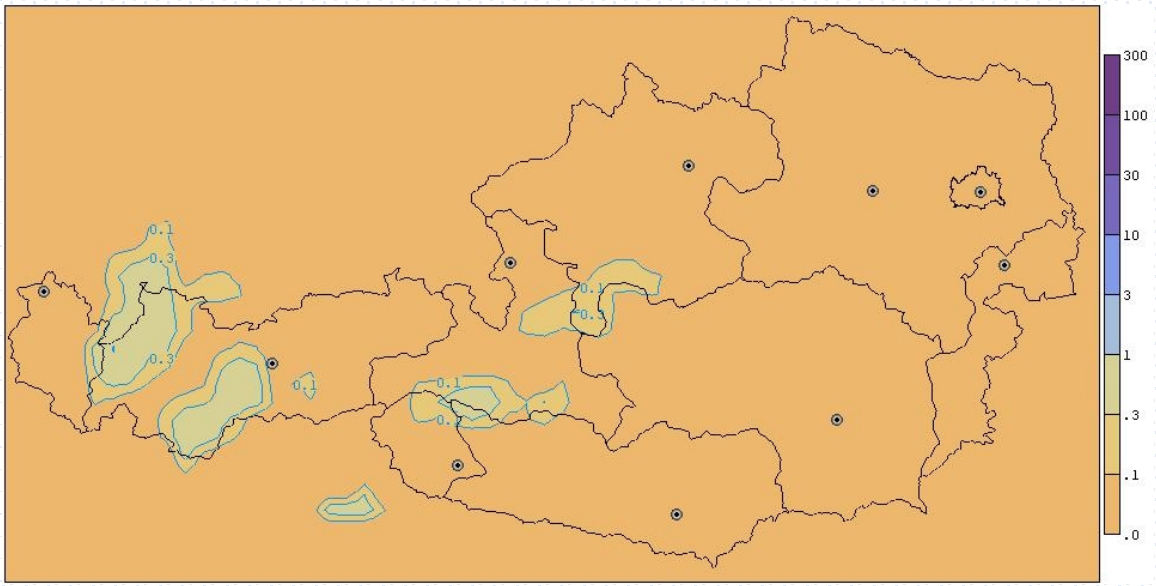
- Comparison Aladin-Vienna with and without envelope-topography
- Comparison Aladin-Austria with and without envelope-topography, Aladin-Vienna without envelope-topographie

Cumulated convective precipitation, 6th May 2003

Aladin-Vienna
Envelope topography
37 Levels

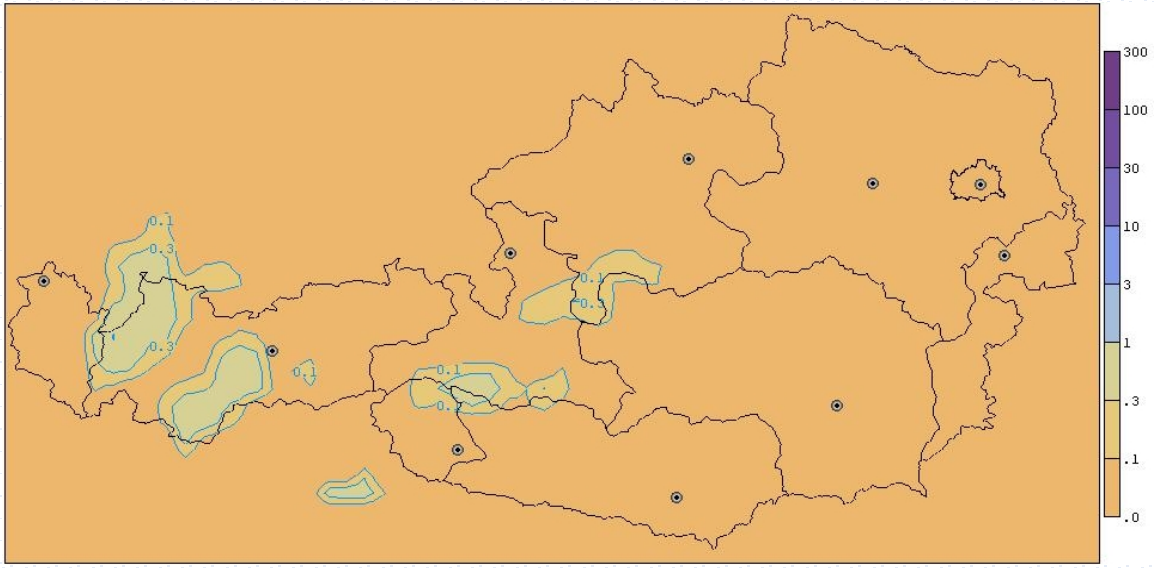


Aladin-Austria
Envelope topography
45 Levels

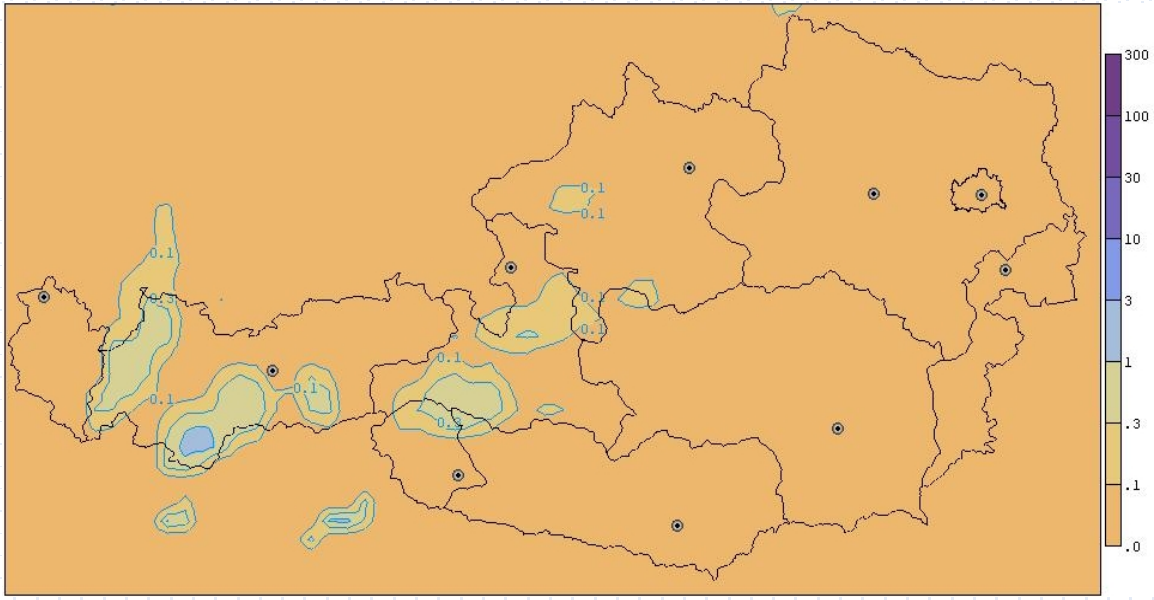


Cumulated convective precipitation, 6th May 2003

Aladin-Austria
Envelope topography
45 Levels

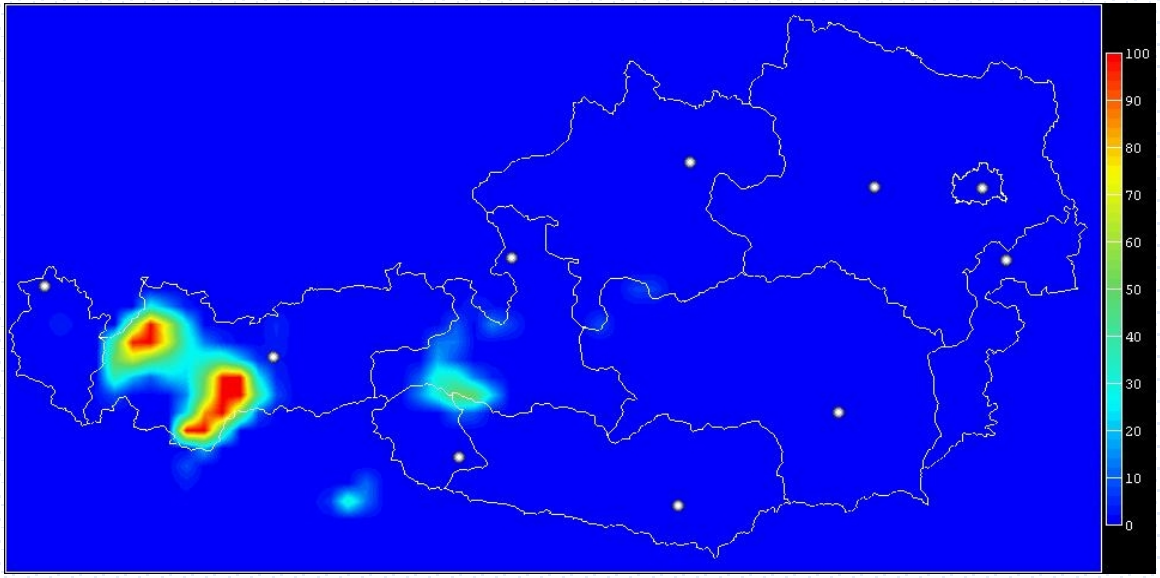


Aladin-Austria
Non-Envelope
topography
45 Levels

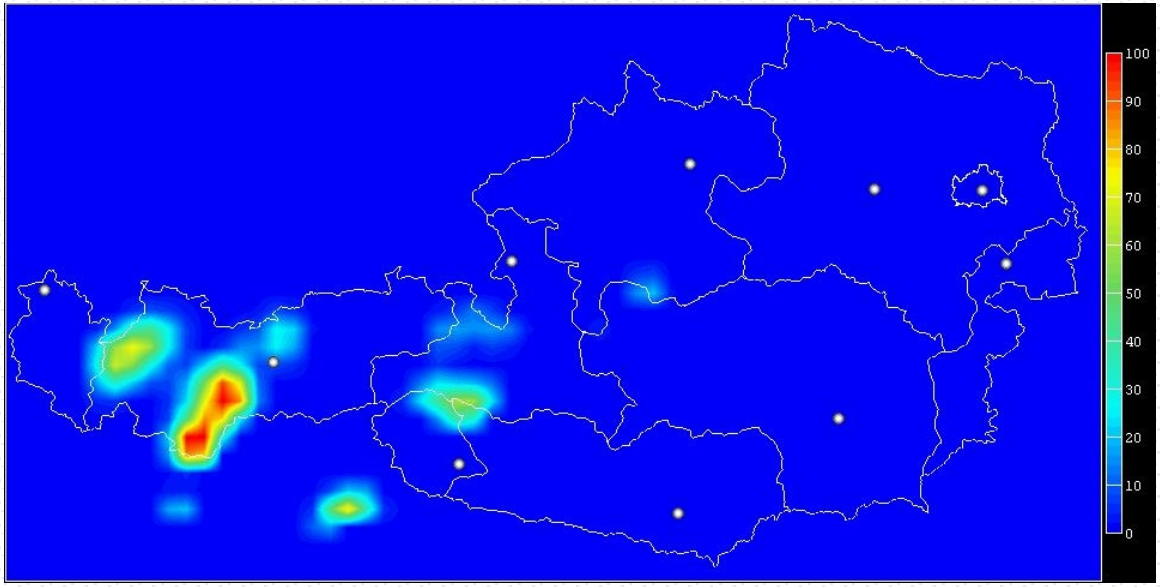


CAPE, 6th May 2003, 14 UTC

Aladin-Vienna
Envelope topography
37 Levels

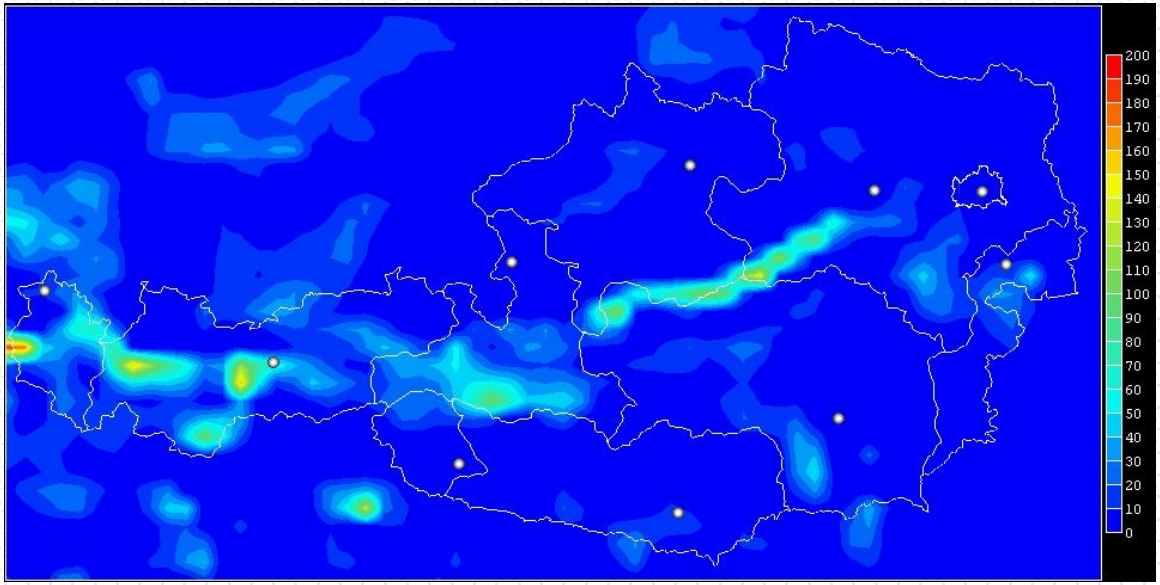


Aladin-Austria
Envelope topography
45 Levels

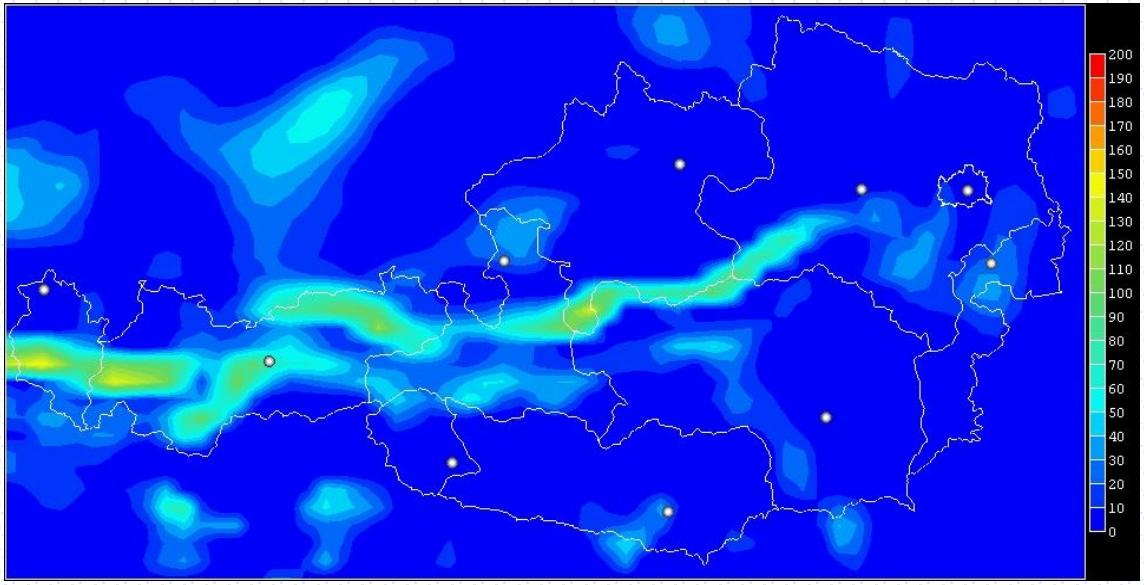


MOCON, 6th May 2003, 15 UTC

Aladin-Vienna
Envelope topography
37 Levels



Aladin-Austria
Envelope topography
45 Levels



4. Conclusions & Summary

- Less unstable conditions with mean topography → pos. impact on deep convection
- More realistic conv. precipitation due to more vertical levels (rainfall evaporation?)
- Increased grid-scale precipitation with non-envelope topography at the beginning of the integration (increased depth of moist layer)