TSTARTSC =0.5 and for exponent of beta EXPONENT=4.

4.6 Tuning of the parameters for spectral relaxation in ALADIN

Supplementary experiments for finding the best interval for relaxation for alpha function were done. Spectra of the vorticity were computed for elliptical wavenumbers in the Figure 6a, 6b, 6c in order to identify the wavenumbers from the large scale which represent the missing cyclone in the LAM.

(a) comparison of the vorticity spectra of 1h gridpoint coupling frequency, the ideal case with cyclone inside (full line) with 6h gridpoint coupling frequency, with missing cyclone (dashed line) (Figure 6a).

(b) comparison of the vorticity spectra from the coupling file at + 6h (full line) and 6h gridpoint coupling frequency, missing cyclone(dashed line) (Figure 6b).

(c) comparison of the vorticity spectra with spectral coupling with one hour frequency, cyclone is inside (dashed line) and 6h gridpoint coupling frequency, missing cyclone (full line) (Figure 6c).

From these figures it can be observed that the energy of the cyclone is carried only by the lowest wavenumbers of the spectra in between 2-12 wavenumbers.

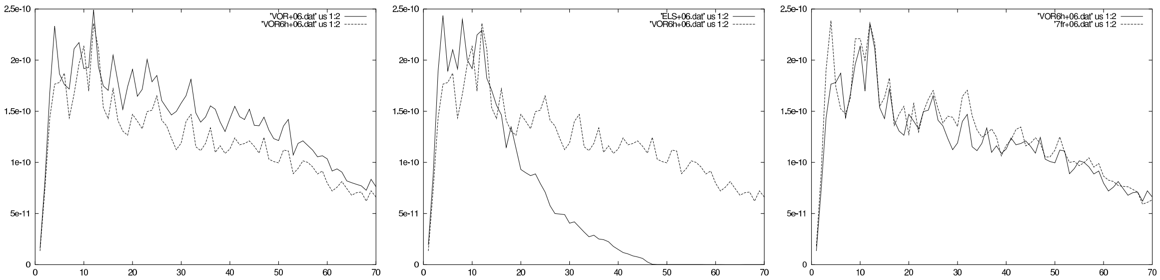

Figure 6: Spectra of the vorticity computed for the elliptical wavenumbers: (a) 1h GPCPL (full line) and 6h GPCPL (dashed line), (b) first coupling file after 6h (full line) and GPCPL after 6h integration (dashed line), (c) 1h SPCPL (dashed line) and 6h GPCPL (full line).

The results were very similar with the ones taken in the 1D tests that it would be suitable to choose K in the first wavenumbers of the spectrum.

4.7 Other sensitivity tests

Numerical simulations were performed intending to investigate the use of the spectral coupling method peformance. Several experiments were done with the operational ALADIN-Slovenia model versus ALADIN-Slovenia model using spectral coupling on Slovenia domain on a usual case of zonal weather without strong fronts. At the first look it was observed that the spectral coupling method does not impede the forecast ability of the LAM. The total precipitaton field was compared using the operational run with classic coupling scheme Davies flow-relaxation (Figure 7a) and the integration with spectral coupling scheme (Figure 7b).

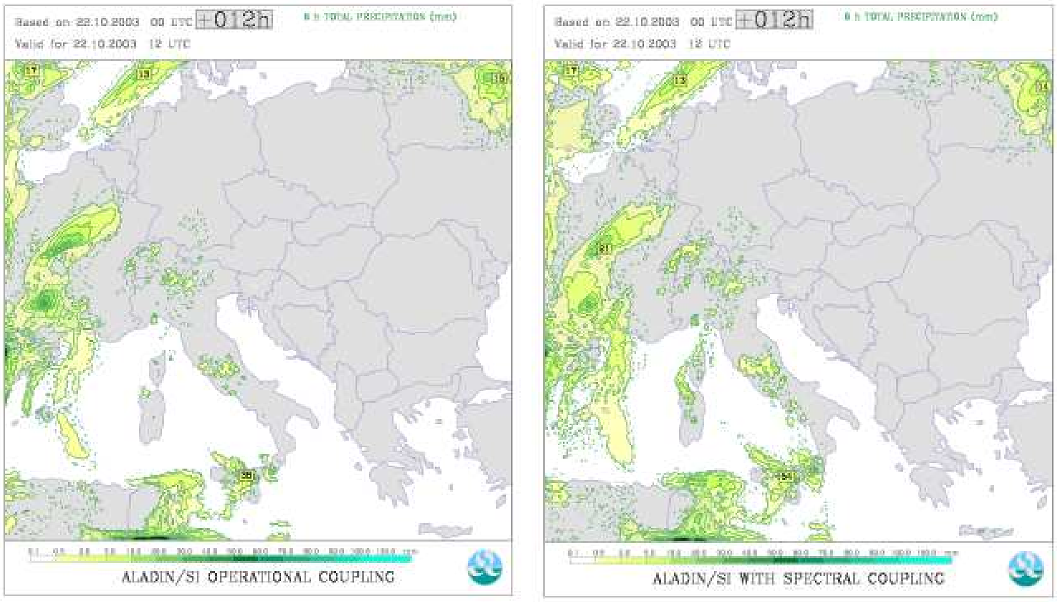

Figure 7: Total precipitation field for 6h forecasted by ALADIN-Slovenia valid 22.10.2003 using: (a) operational Davies coupling, (b) spectral coupling.

It can be remarked the similar structure of the fields which indicates that in such meterological situation the spectral coupling scheme don't produce any harmless.

The results prove that the spectral coupling method succeeds to provide the possible missing large-scale spectral information only with a suitable tuning of the spectral relaxation parameters and only with a properly interpolation method for the spectral coefficients.

5 CONCLUSIONS AND FUTURE PLANS

Most operational NWP models update their lateral boundary condition by using the Davies relaxation scheme. In this paper we propose some potential alternative to improve the quality of coupling a low resolution model with a high resolution one in terms of spectral space while using the same available coupling data. It has to be underlined that spectral coupling scheme tested on Christmas storm case with ALADIN model and on a similar case with the shallow-water unidimensional model gives a promising positive impulse, the tests being seen superior to the traditional coupling scheme. The fact that spectral coupling succeeds to provide the missing large scale information into the high-resolution model in a resonable way should be definitely taken into account. But it should be mentioned that there are some limitations of the applicability of the idea. Hence, it is needed and very necessary to continue the validation work. By studying the method on some more cases it has to be proved that the meso-scale features are not destroyed in situations in which Christmas storm problem is not present, but when ALADIN provides extra meso-scale information with respect to the coupling model. Another point that has to be solved is to find the proper moment to use the proposed coupling method. The idea launched was that the spectral coupling should be applied just in extreme situations when the operational mode seems to be unable to give a reasonable forecast. P.Termonia effort was directed in identification of such situations by estimating the quality of the interpolated lateral boundary data [9]. It should be mentioned that also a different kind of treatment for lateral boundaries can be studied by the implication of the extension zone width in the context of transparent lateral boundary conditions.

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