

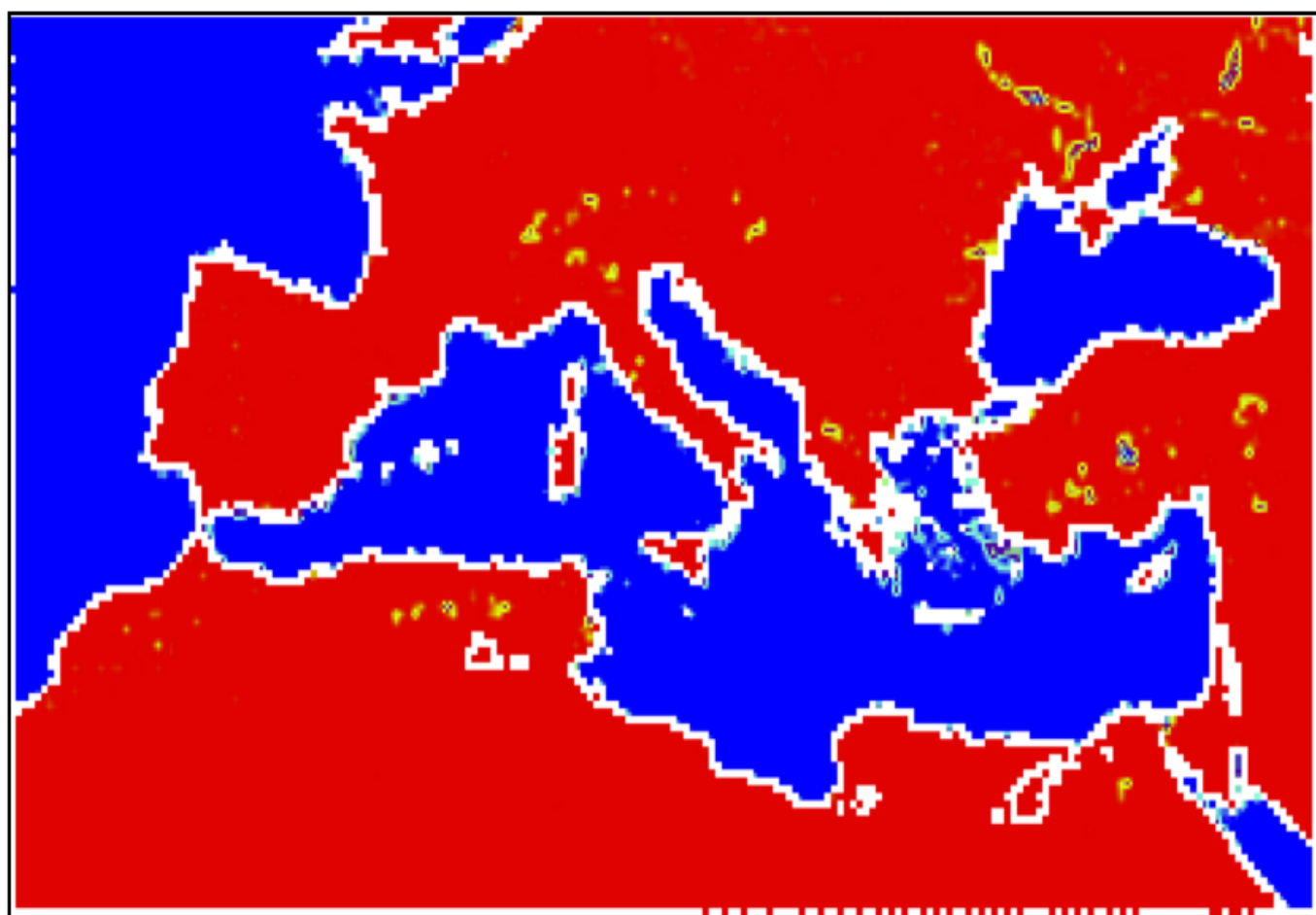
## MOTIVATION

So-called medicanes (Mediterranean hurricanes) are meso-scale, marine, and warmcore Mediterranean cyclones that exhibit some similarities to tropical cyclones. The strong cyclonic winds associated with medicanes threaten the highly populated coastal areas around the Mediterranean basin. To reduce the risk of casualties and overall negative impacts, it is important to improve the understanding of medicanes with the use of numerical models.

## ATMOSPHERIC MODEL

The chosen atmospheric model COSMO-CLM [4] is setup based on Med-Cordex domain. ERA-Interim reanalysis data is used for the lateral and lower boundary conditions in atmosphere-only and except SST in coupled simulations.

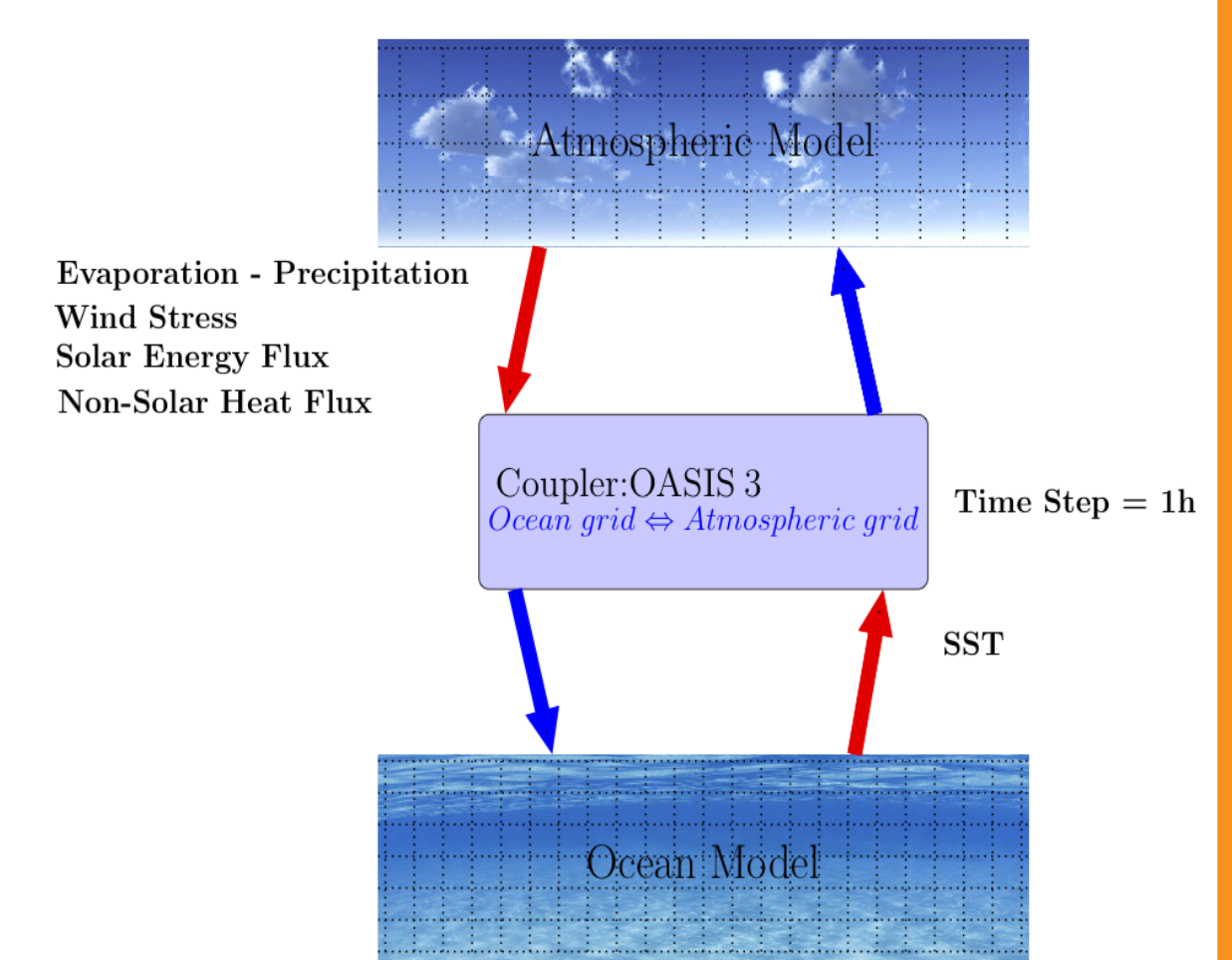
- 0.44°; ~ 50 km; 118x83 and 32  $\sigma$ -levels
- 0.22°; ~ 25 km; 206x120 and 32  $\sigma$ -levels
- 0.08°; ~ 09 km; 536x295 and 40  $\sigma$ -levels
- Time step 150 sec



## METHODS

- The atmospheric and ocean model are coupled via OASIS3
- 11 Mediane case from 1983 to 1999 [1] are simulated using coupled and atmosphere-only model
- Validation data; MERRA [2] and NOAA [3]

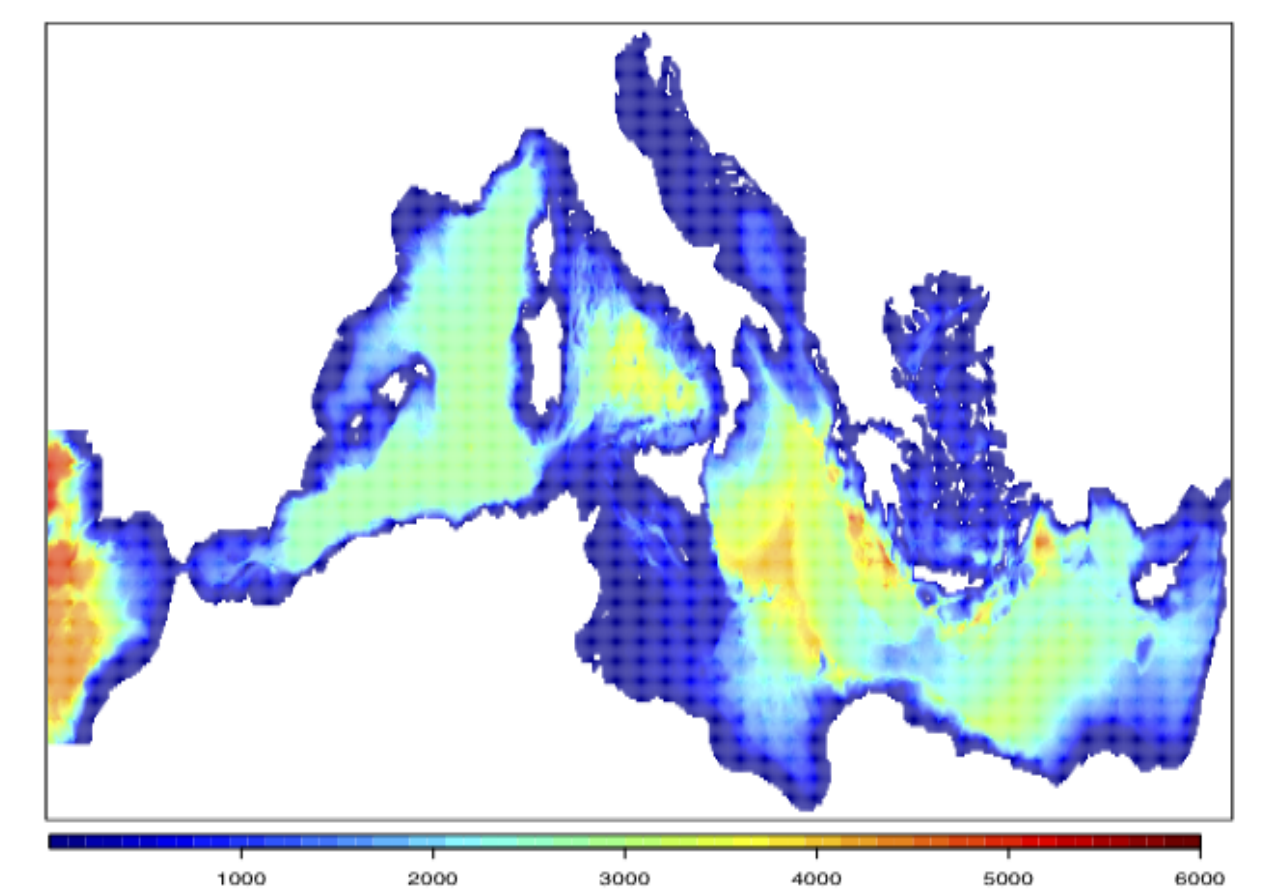
## OASIS3 COUPLER



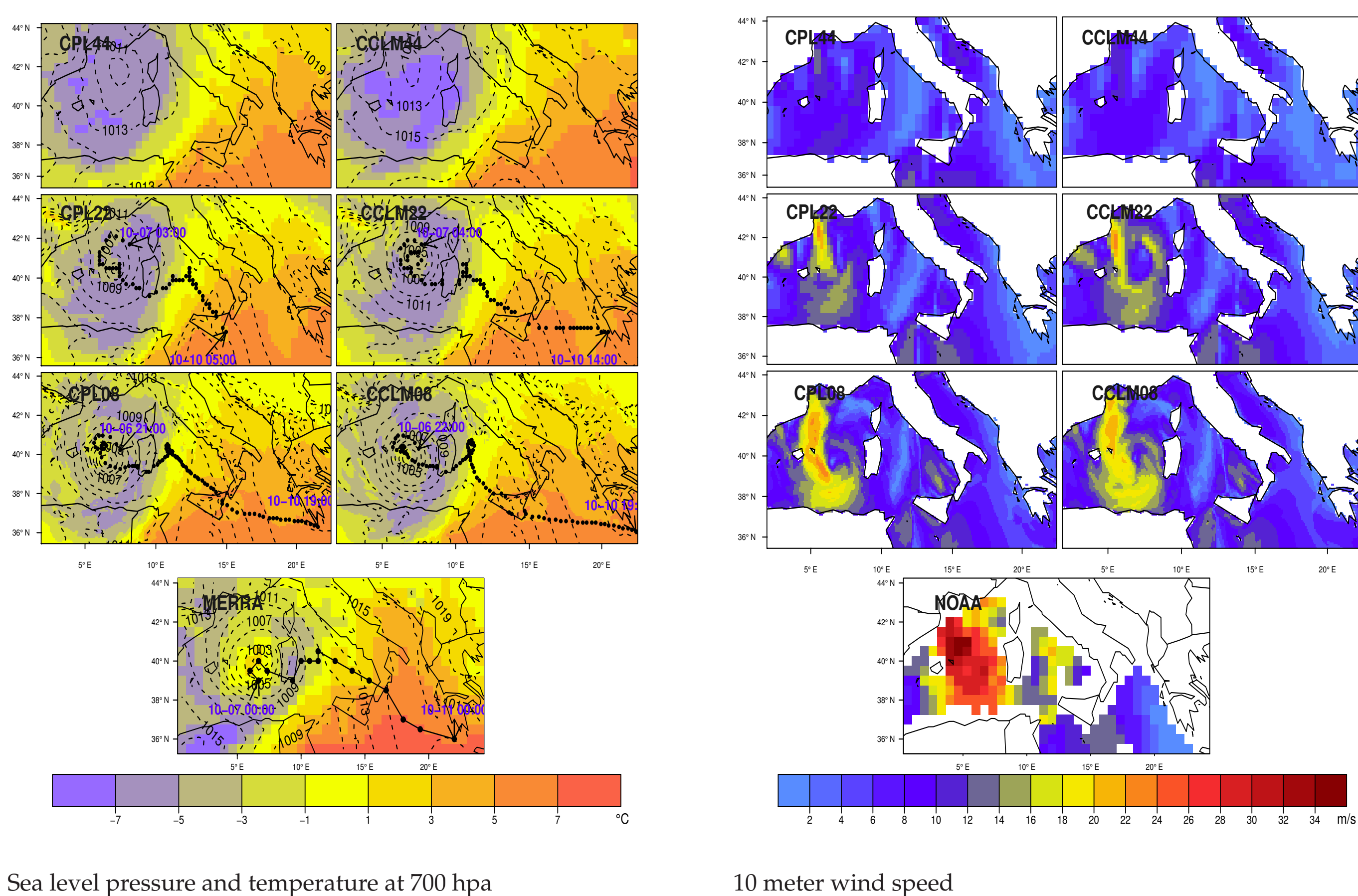
## OCEAN MODEL

The 1-D configuration of NEMO-MED12 v3.2[6] adopted to the Mediterranean Sea is coupled with CCLM.

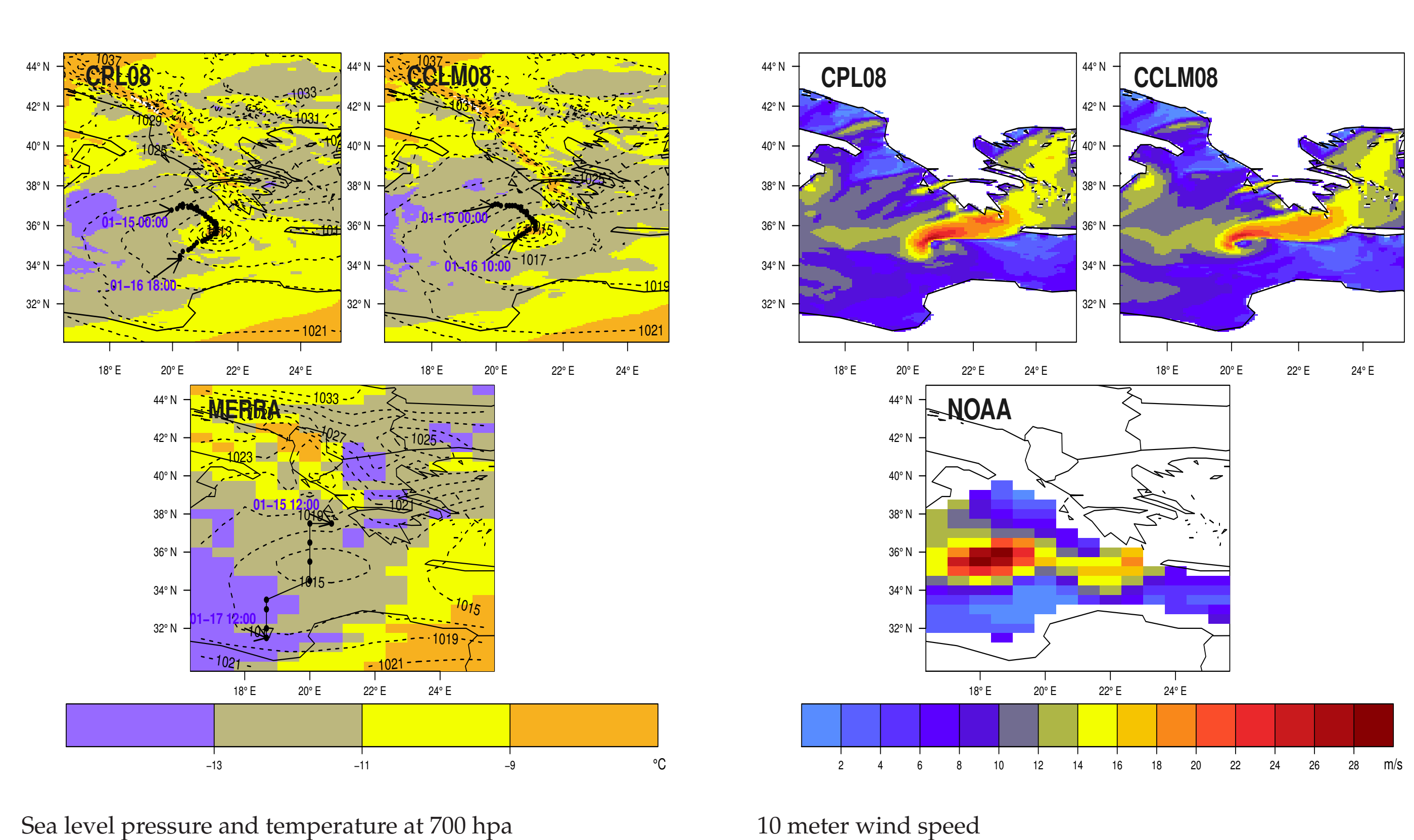
- 1/12°; ~ 7.5 km 567x264 and 50 vertical levels
- Initial condition from MEDATLAS-II climatology [5]
- Time step 720 sec



## 6 OCTOBER 1996 CASE



## 15 JANUARY 1995 CASE



## REFERENCES

- [1] Tous, M. and Remero, R.: Meteorological environments associated with medicane development, *Int. J. Climatol.*, 33, 1714, 2013.
- [2] Rienecker, M. M. et al. TS5: MERRA – NASA's Modern-Era Retrospective Analysis for Research and Applications, *J. Climate*, 24, 3624-3648, 2011.
- [3] Zhang, H. M., Bates, J. J., and Reynolds, R. W.: Assessment of composite global sampling: sea surface wind speed, *Geophys. Res. Lett.*, 33, L17, 2006.
- [4] Rockel, B., Will, A and A. Hense: Rockel B, Will A, Hense A (2008) The regional climate model COSMO-CLM (CCLM). *Meteorol Z*, 17, 347-348, 2008.
- [5] Rixen, M: MEDAR/MEDATLAS-II, HyMeX.MEDAR/MEDATLAS-II.20120112, 2012.
- [6] Lebeaupin, B. C., Béranger, K., Delteil, C., and Drobinski, P.: The Mediterranean response to different space-time resolution atmospheric forcings using perpetual mode sensitivity simulations, *Ocean Model.*, 36, 1-25, 2011.

## CONCLUSION

- Model's performance depends strongly on the atmospheric grid resolution most of the medicane feature are well resolved at higher resolution 0.08°
- Compared to atmosphere-only simulations, the coupled model did not show any significant improvement at 0.44° and 0.22° resolution
- In most of the case medicane track length is longer in coupled simulations compared to atmosphere-only simulation at higher resolution 0.08°
- The characteristic features of medicanes, such as warm-cores and high wind speeds, are more intense in coupled simulations compared to atmosphere-only simulations

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