

Evaluating current convection-permitting ensembles for past high-impact precipitation events in Italy: the SPITCAPE Special Project

Valerio Capecchi - LaMMA, Florence, Italy

Goals of the ECMWF Special Project SPITCAPE

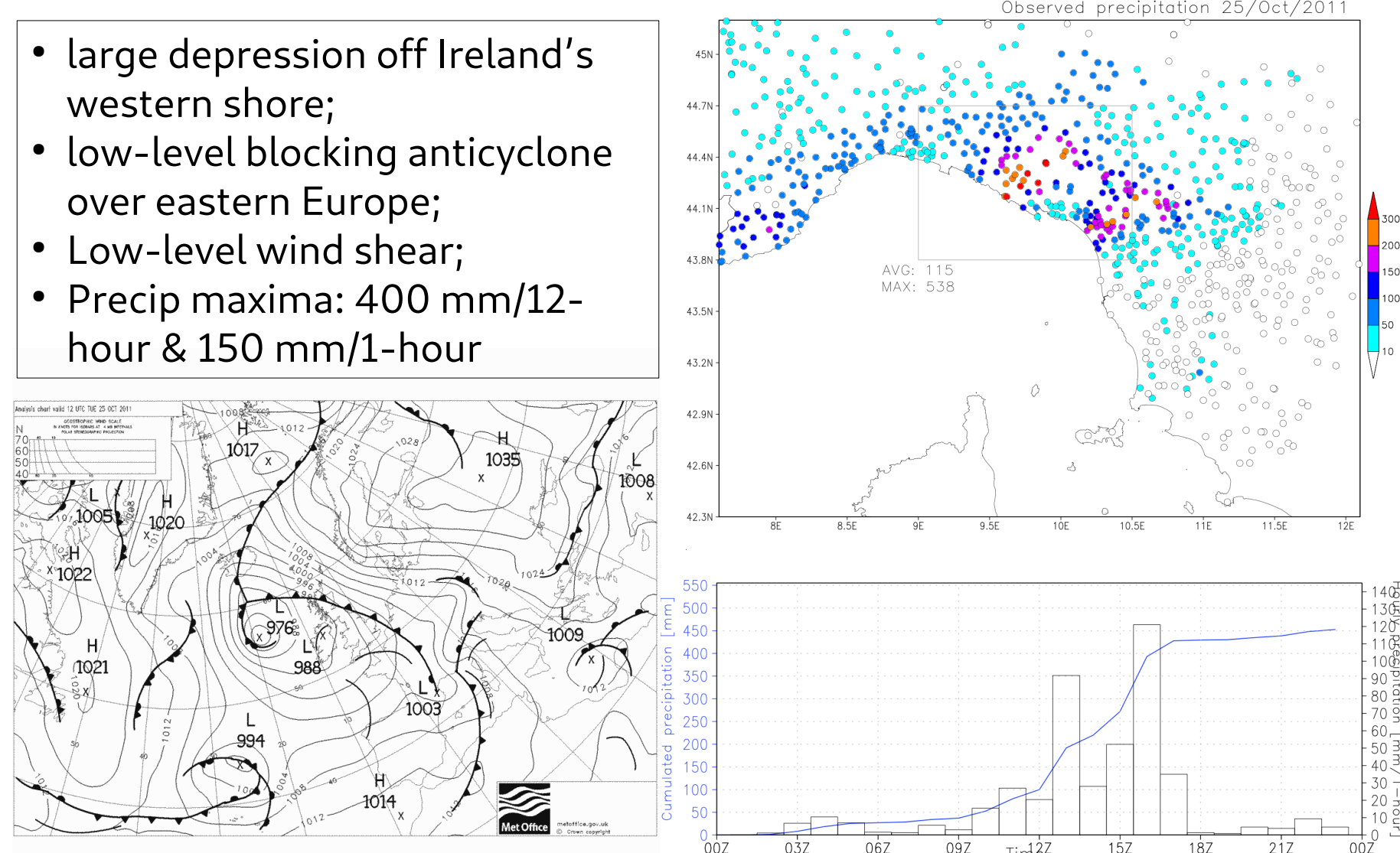
- 1) understand the information content of a cascade of state-of-the-art ensembles, from global-to-local, by re-forecasting past high-impact precipitation events (HPEs)
- 2) investigate the added value of running a convection-permitting ensemble directly nested (ie dynamical downscaling) into the ECMWF global ensemble at Tco639L91 resolution

	ENS	WRF-ENS
Model	IFS cycle 41r2 (March 2016)	WRF 3.8.1 (August 2015)
Grid spacing	~18 km	3 km
Nr of members	50 + control	50 + control
Boundary cond	N/A	ENS
Convection	parametrised	resolved
Forecast range	7 days to 1 day (init. 00 & 12)	3 days to 1 day (init. 00 & 12)

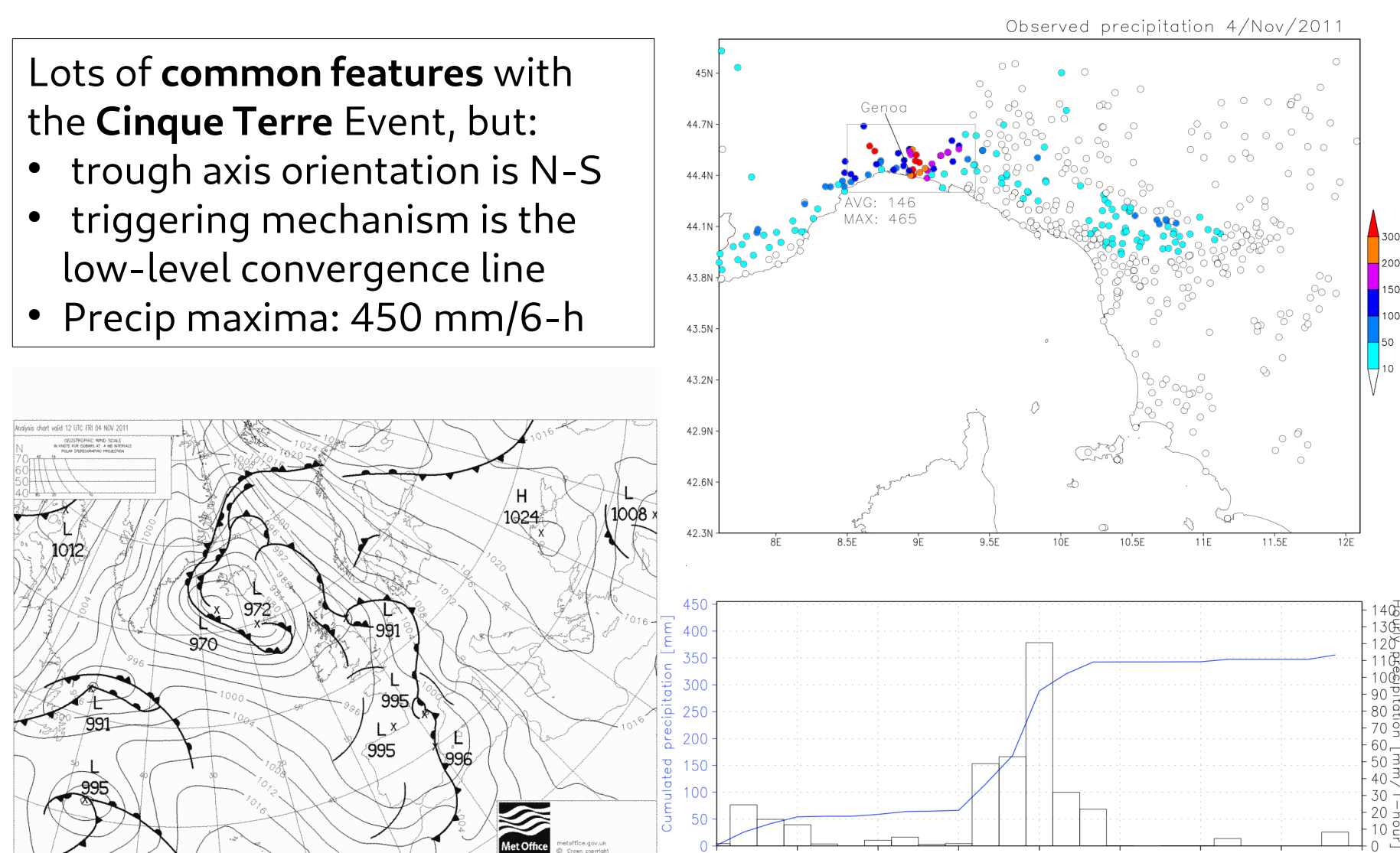
Data and Methods

Observations

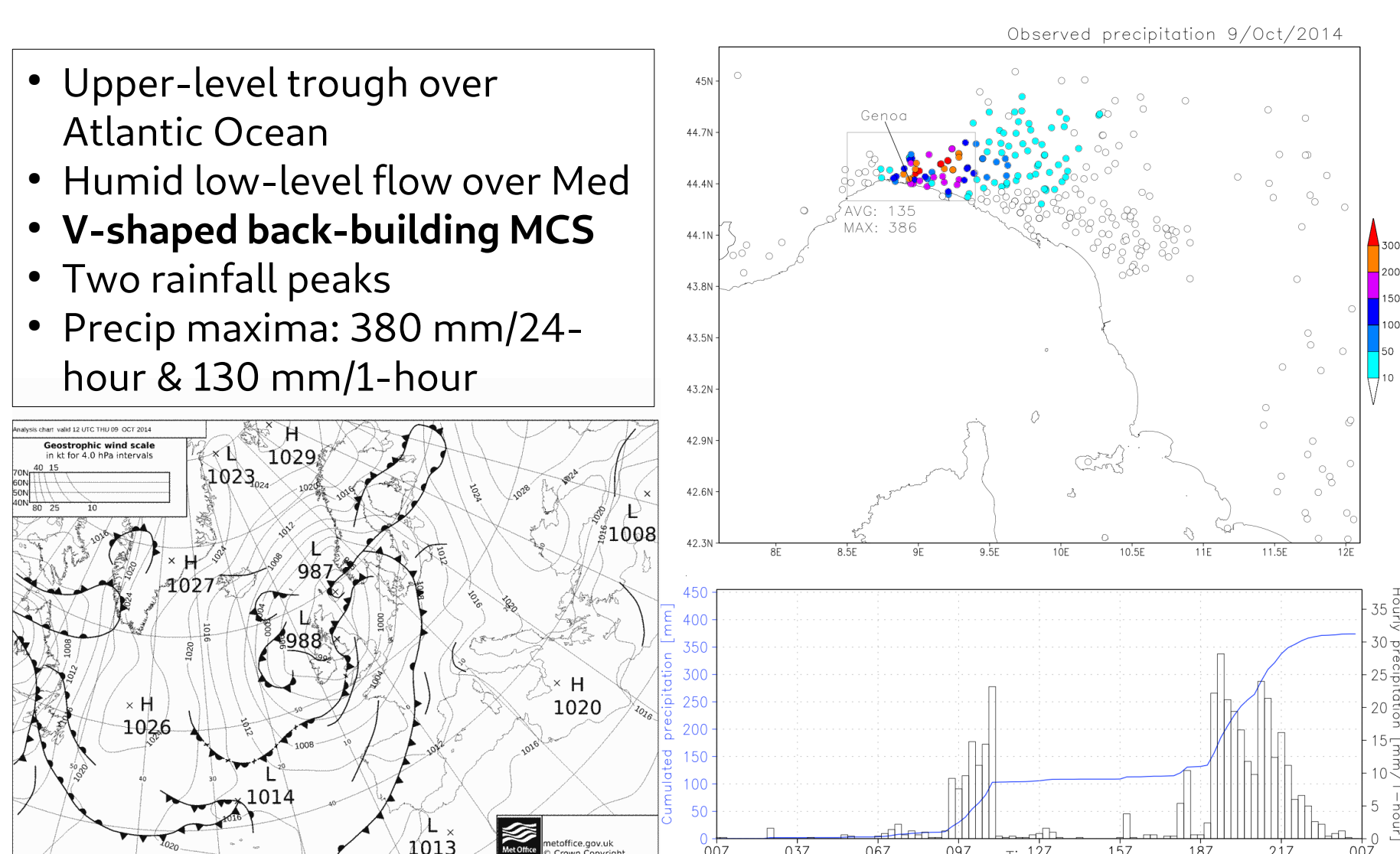
Cinque Terre 25 Oct 2011



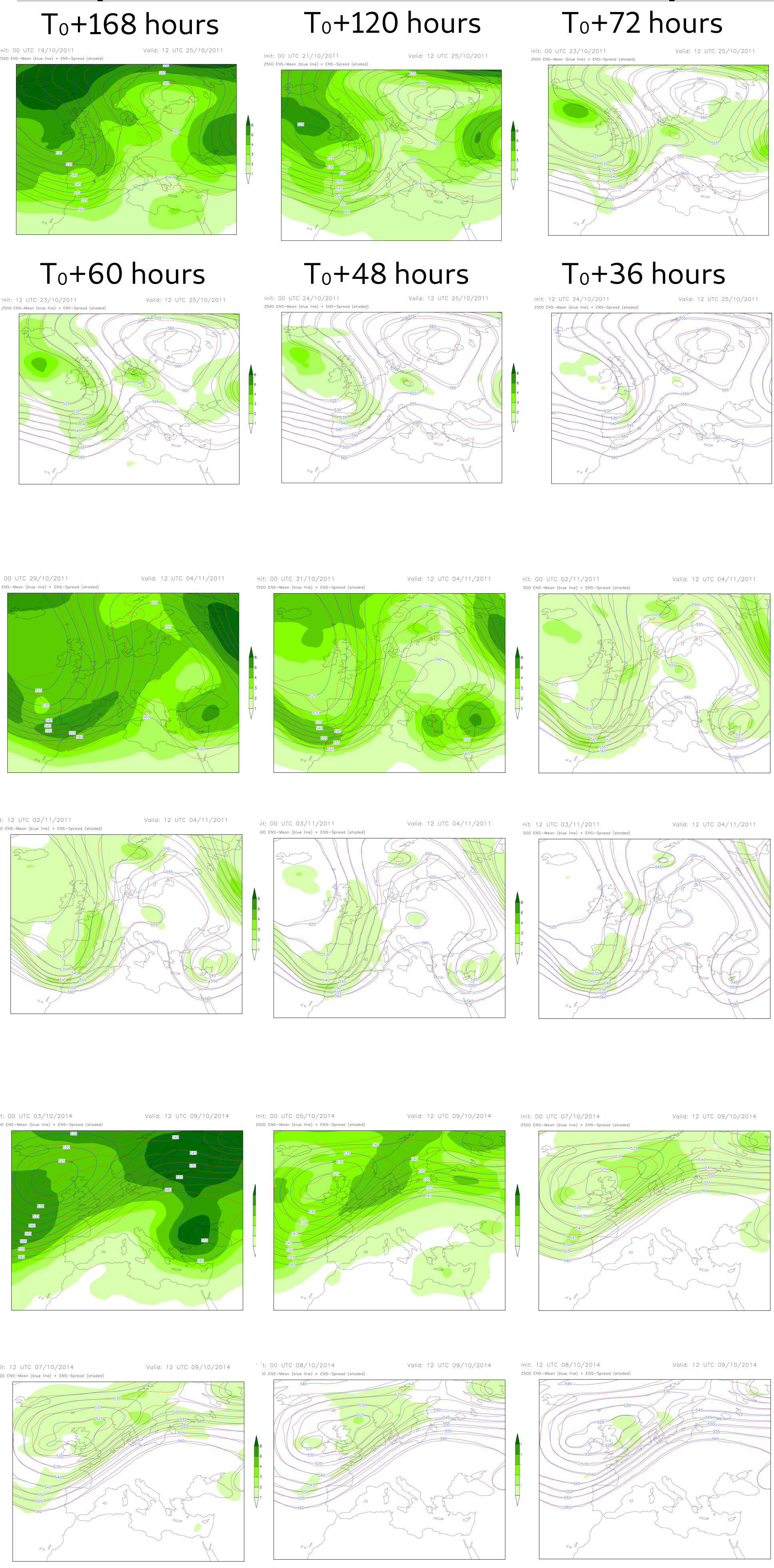
Genoa 4 Nov 2011



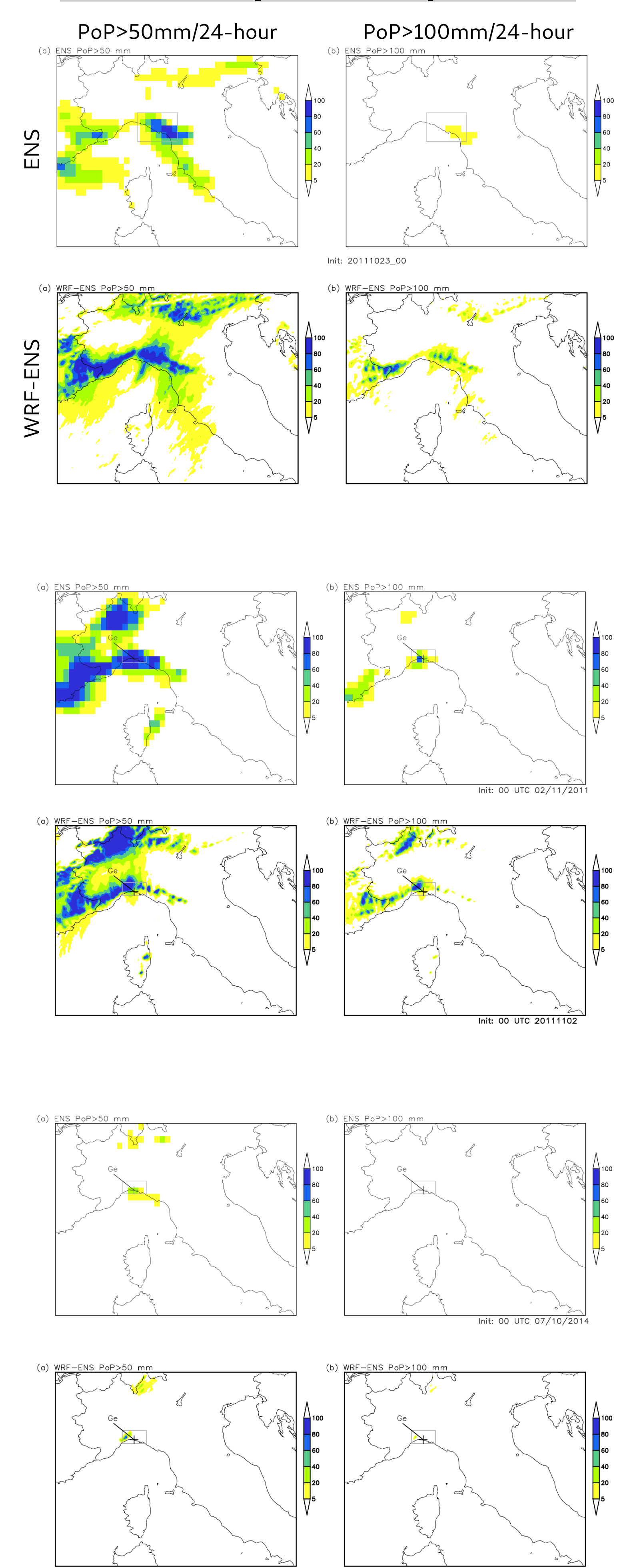
Genoa 9 Oct 2014



Geopotential 500 hPa Ensemble Spread



Probability of Precipitation

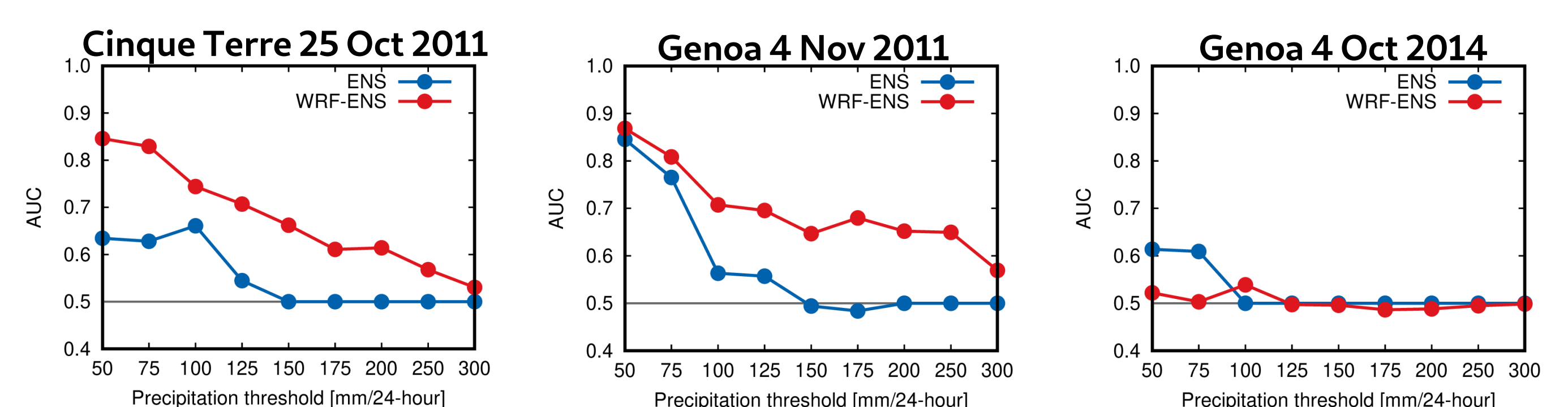


Results

Verification of 24-hour accumulated precipitation

Forecast range	Cinque Terre 25 Oct 2011		Genoa 4 Nov 2011		Genoa 9 Oct 2014	
	ENS	WRF-ENS	ENS	WRF-ENS	ENS	WRF-ENS
T ₀ +36 hours	106	107	133	156	164	176
T ₀ +48 hours	114	127	130	151	165	169
T ₀ +60 hours	112	113	138	159	169	189
T ₀ +72 hours	121	112	135	146	171	153

Root Mean Square Error (RMSE) of Ensemble Mean precipitation prediction



Receiver Operating Characteristics (ROC) Area for different precipitation thresholds (all starting dates)

Conclusions

- 1) ENS outperforms WRF-ENS when considering Ensemble Mean precipitation prediction for forecast range < 72 hours
- 2) WRF-ENS is better than ENS when looking at the ROC Area for thresholds up to 250 mm (Cinque Terre 2011 & Genoa 2011)
- 3) No skills for ENS & WRF-ENS for Genoa 2014 (missing/misplacement triggering mechanism? further investigations needed)

References: Buzzi et al (2014): Heavy rainfall episodes over Liguria in autumn 2011: numerical forecasting experiments, NHESS.; Davolio et al (2015): Effects of Increasing Horizontal Resolution in a Convection Permitting Model on Flood Forecasting: The 2011 Dramatic Events in Liguria (Italy), J. Hydromet.; Davolio et al (2017): Impact of rainfall assimilation on high-resolution hydro-meteorological forecasts over Liguria (Italy), J. Hydrometeorol.