Presentación reunión de trabajo de PREDIMET

Sistemas de predicción por conjuntos basados en perturbar el campo de vorticidad potencial y en multifísica

Diseño y aplicaciones

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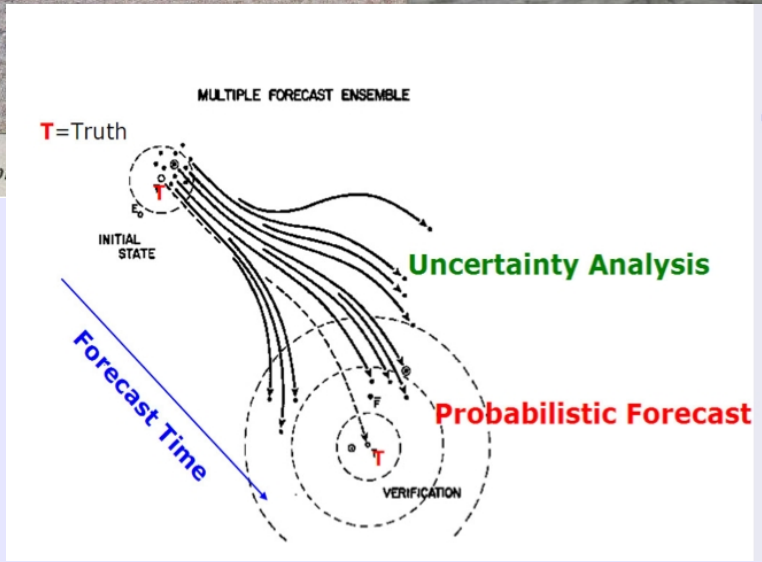
Palma, 19-20 abril 2012

The western Mediterranean area

- Very cyclogenetic
- High impact weather phenomena

La lluvia incomunicó un acceso p



- Ensemble prediction system
  - Perturbed initial and boundary conditions
  - Multiphysics
  - Multi-model

Ensemble prediction systems
applied to
Mediterranean high impact cyclones associated with heavy rain

- Muliphysics

  different combinations of model physical parameterization set

- PV-perturbed

  initial and boundary conditions through three-dimensional PV structure

  - PV-gradient

    most intense values and gradients PV zones

  - PV-adjoint

    MM5 adjoint model calculated sensitivity zones

Build the Multiphysics Ensemble Forecasts

Different combinations of
MM5 physics parameterization

12 members
+
control member

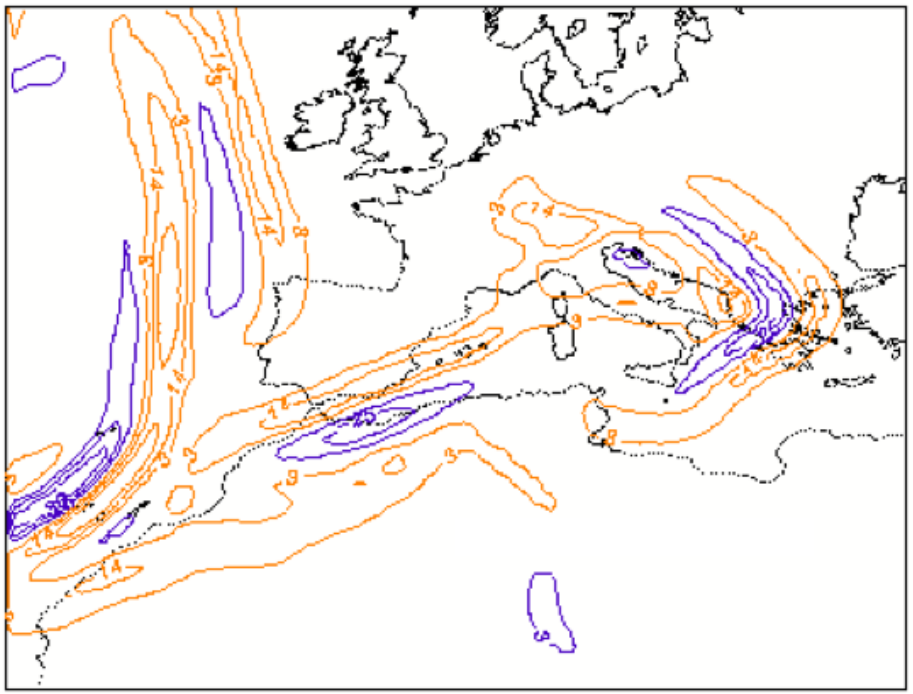
- Explicit Moisture Schemes
  - 6 (Goddard microphysics)
  - 7 (Reisner graupel)
  - 8 (Schultz microphysics)
- Cumulus Parameterizations
  - 3 (Grell)
  - 6 (Kain-Fritsch)
- PBL Schemes
  - 4 (Eta)
  - 5 (MRF)

634, 635, 664, 665, 734, 735, 764, 765, 834, 835, 864, 865, 785 (control)

Build the two PV-perturbed Ensemble Forecasts

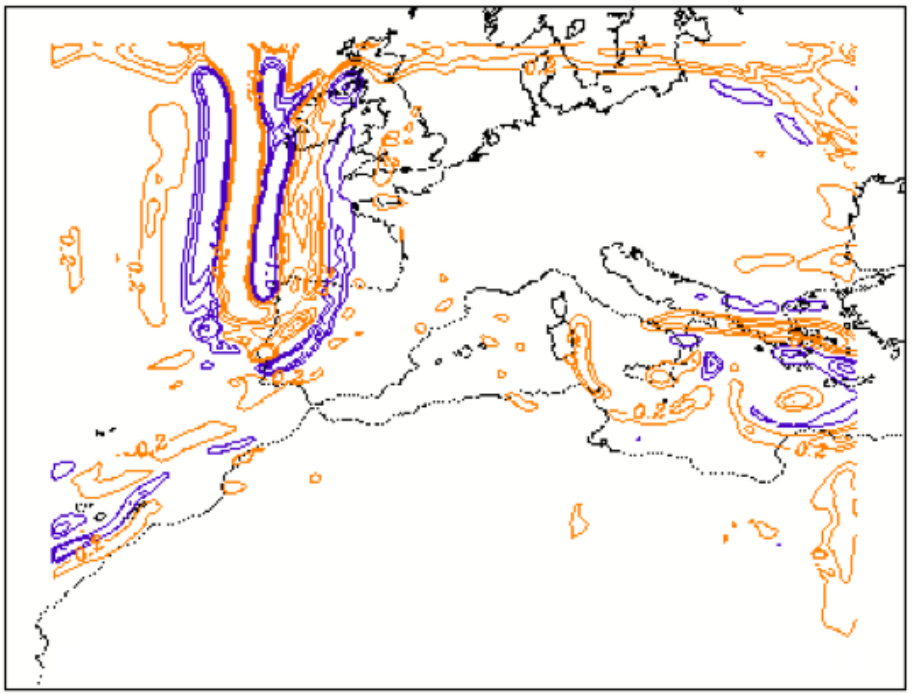
Introduce realistic perturbations randomly to the PV fields through a PV error climatology along the three-dimensional PV structure

- Objectively:

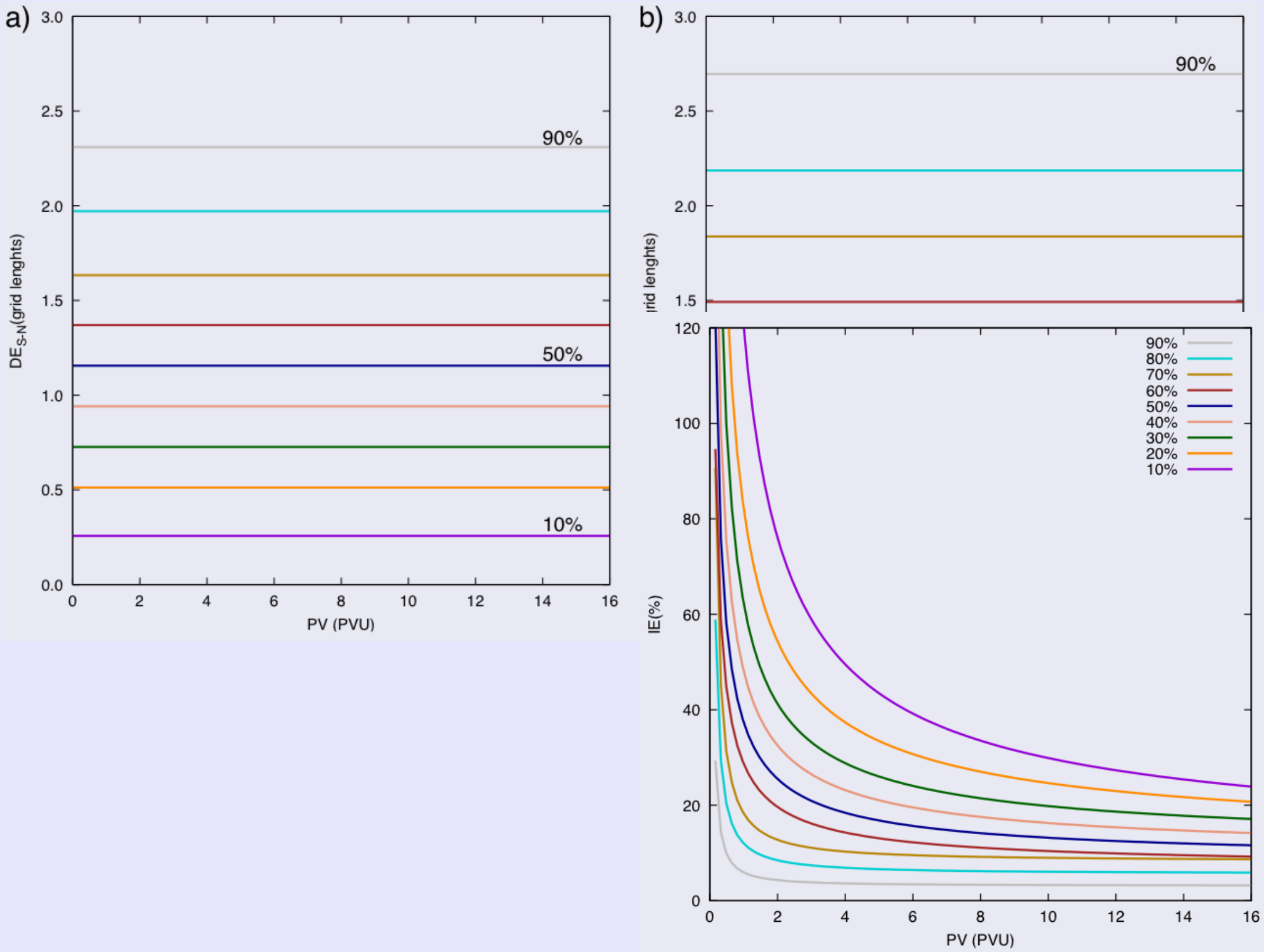


MM5 adjoint model calculated sensitivity zones at 300 hPa

- Subjectively:



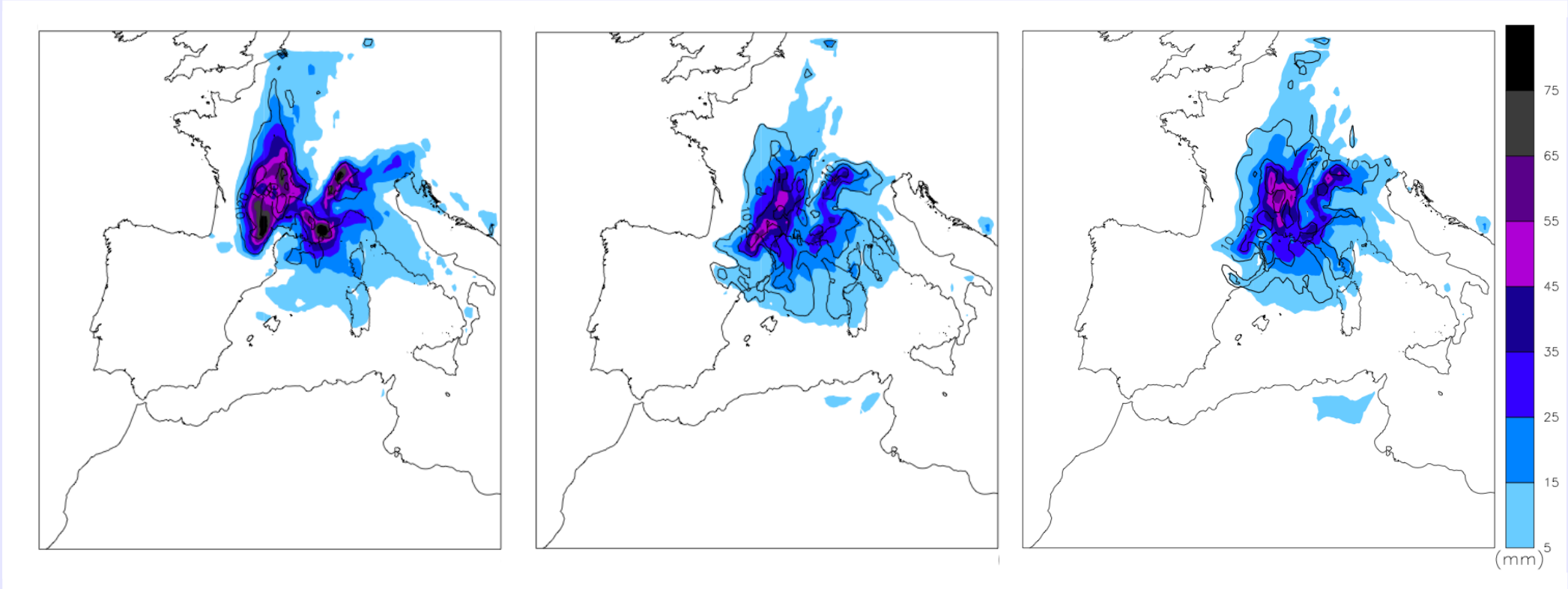
The most intense values and gradients PV zones at 300 hPa

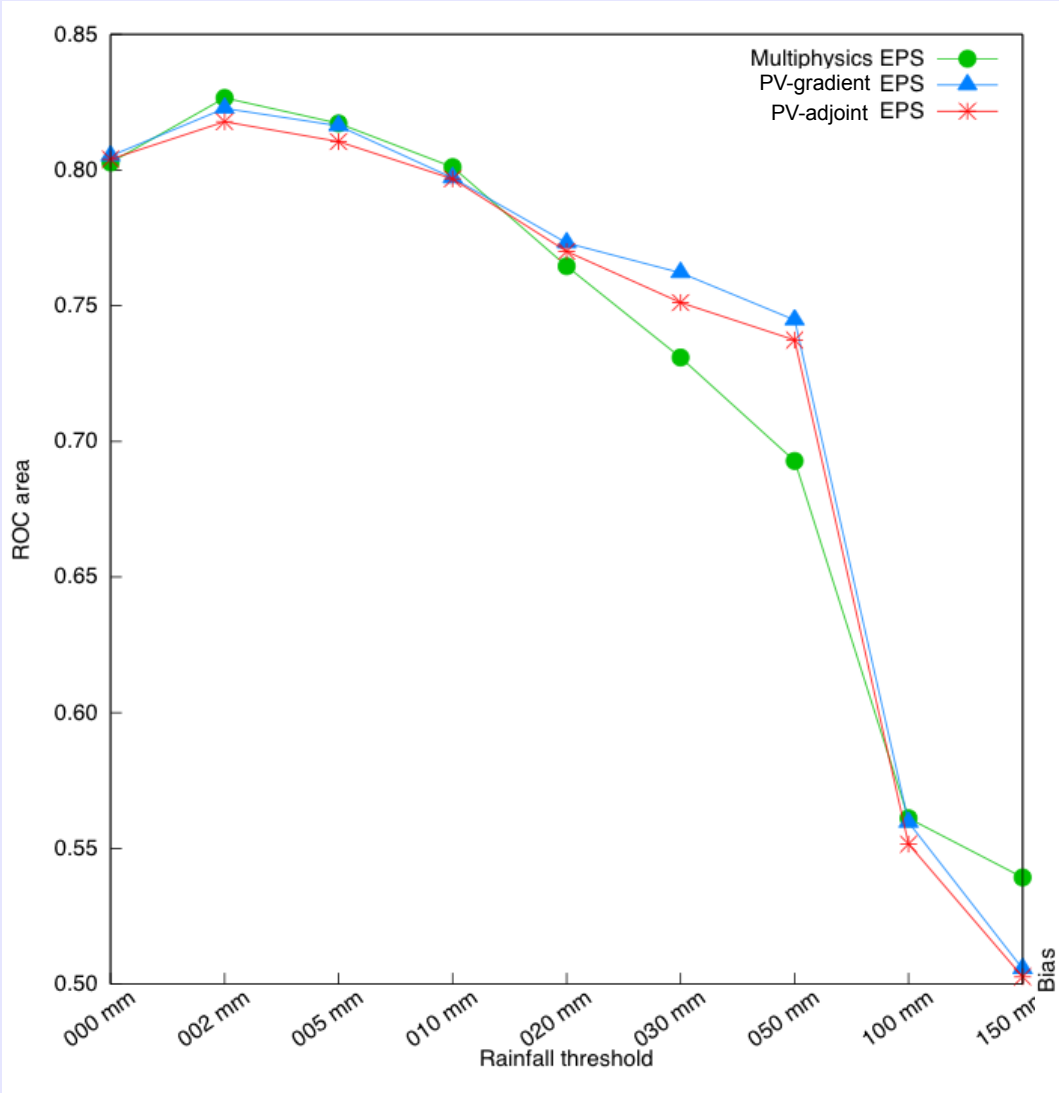

a)
b)
90%
50%
10%
80%
70%
60%
40%
30%
20%
DE_{S-N}(grid lenghts)
IE(%)
PV (PVU)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0
20
40
60
80
100
120
0
2
4
6
8
10
12
14
16

Multiphysics

PV-gradient

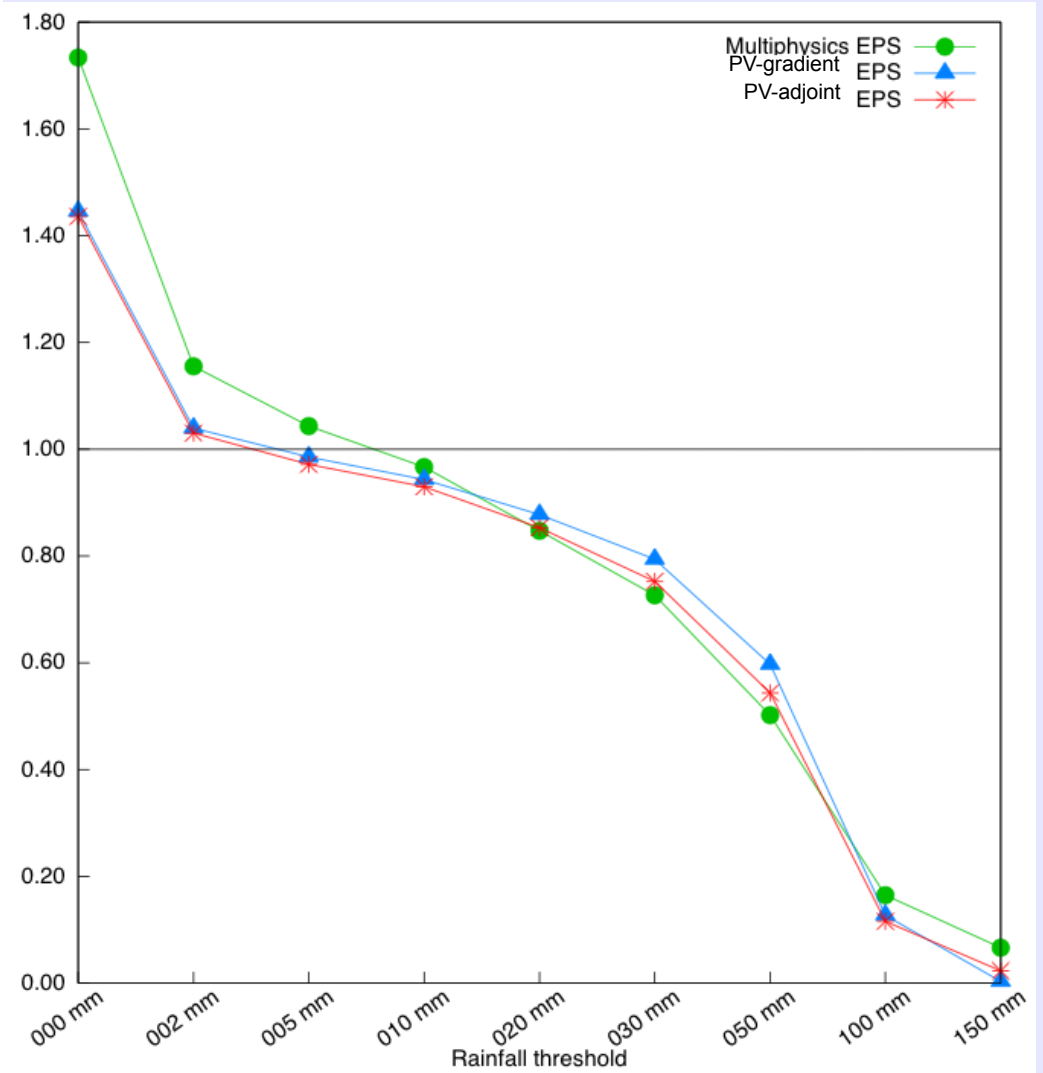
PV-adjoint



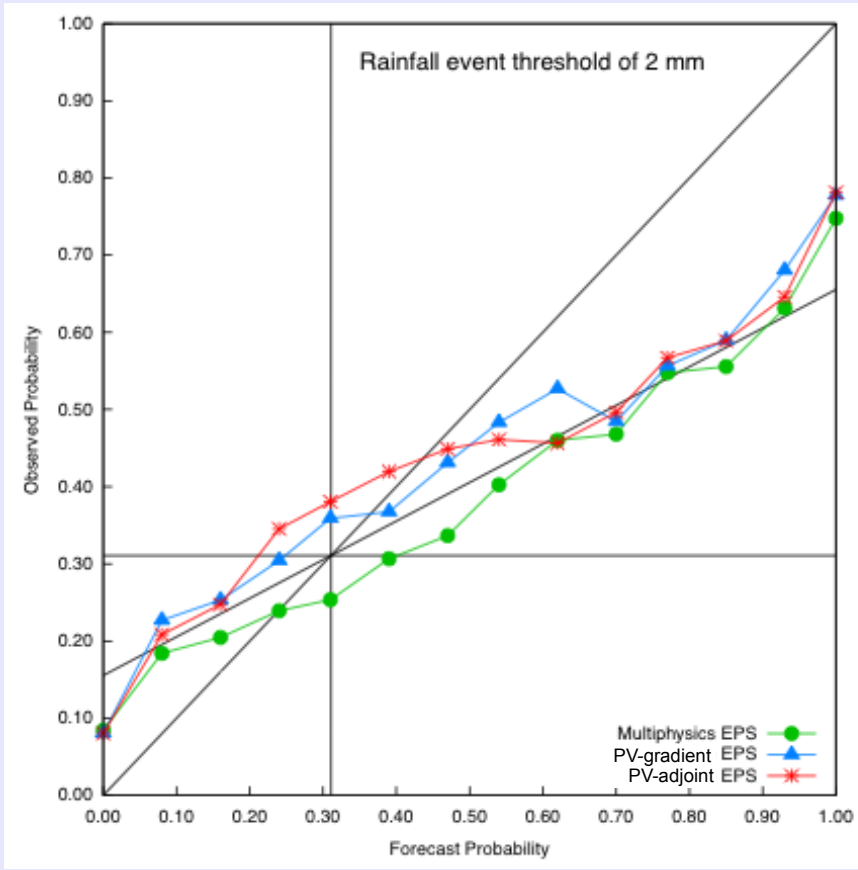


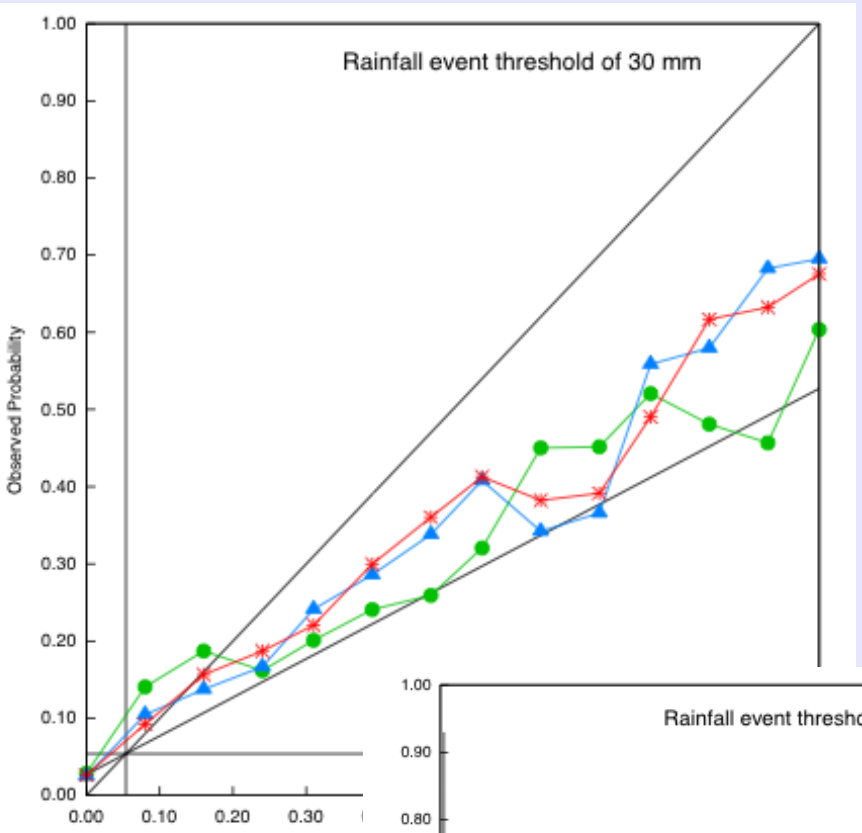
ROC area

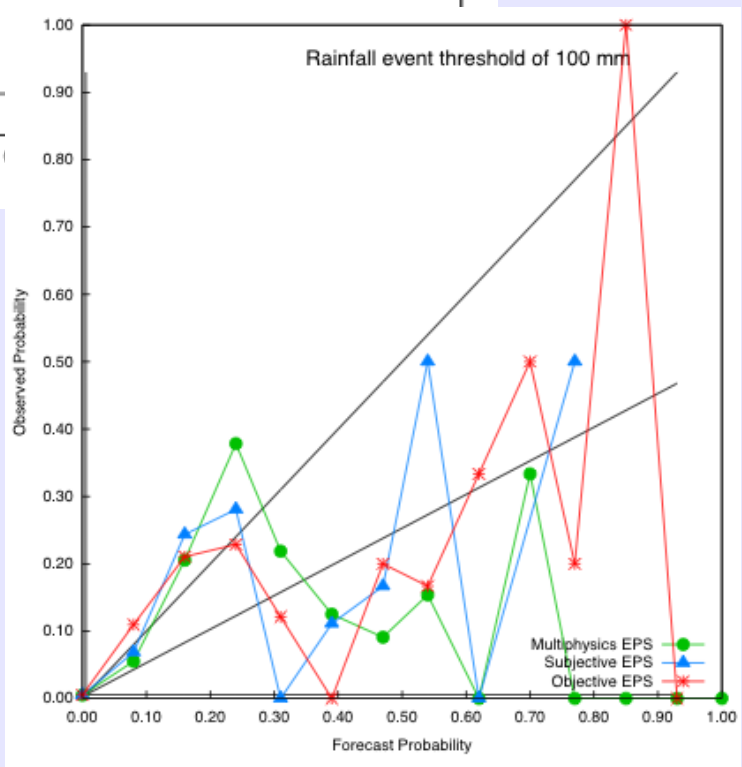
Bias Score



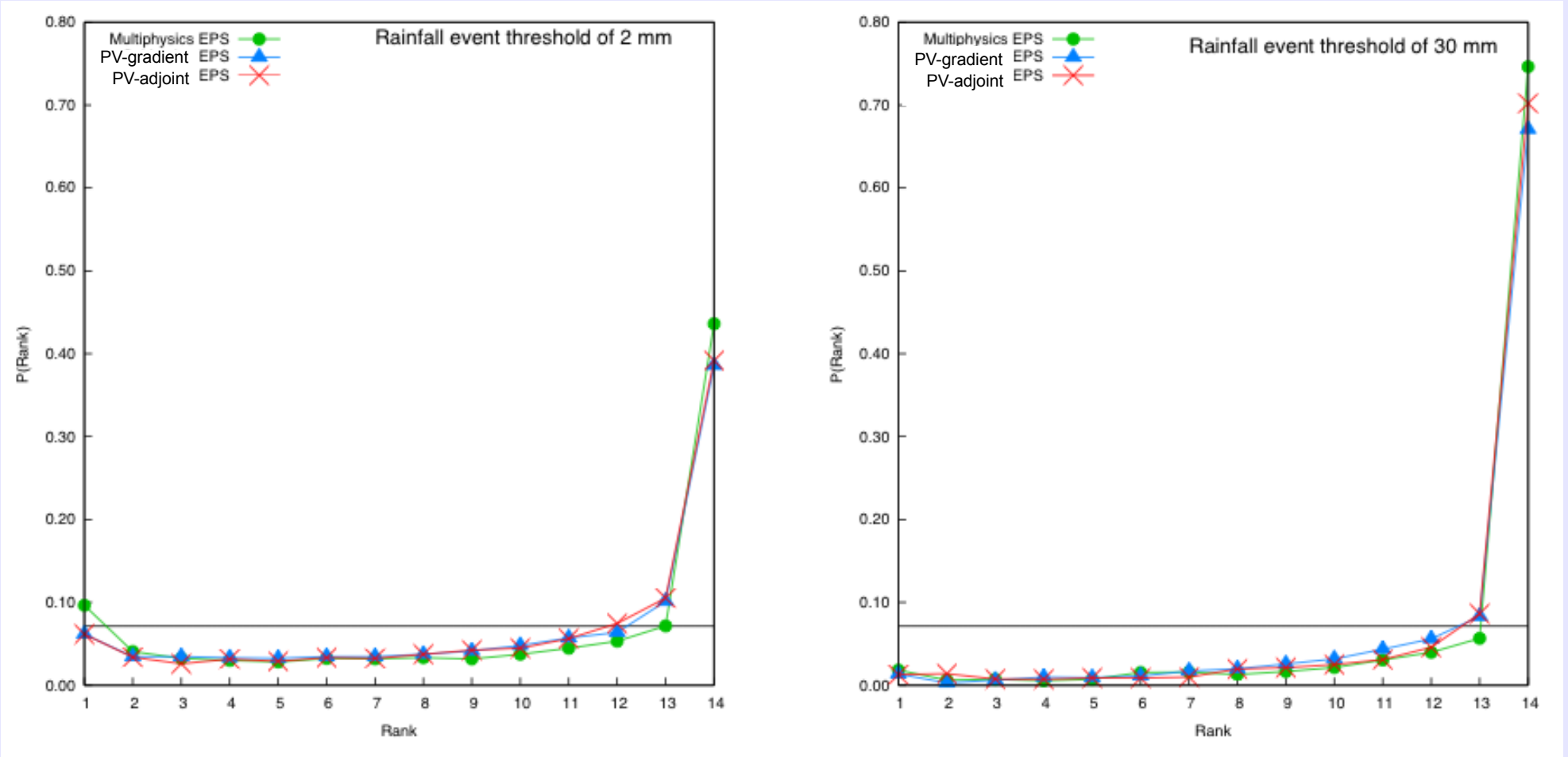
Attribute diagrams

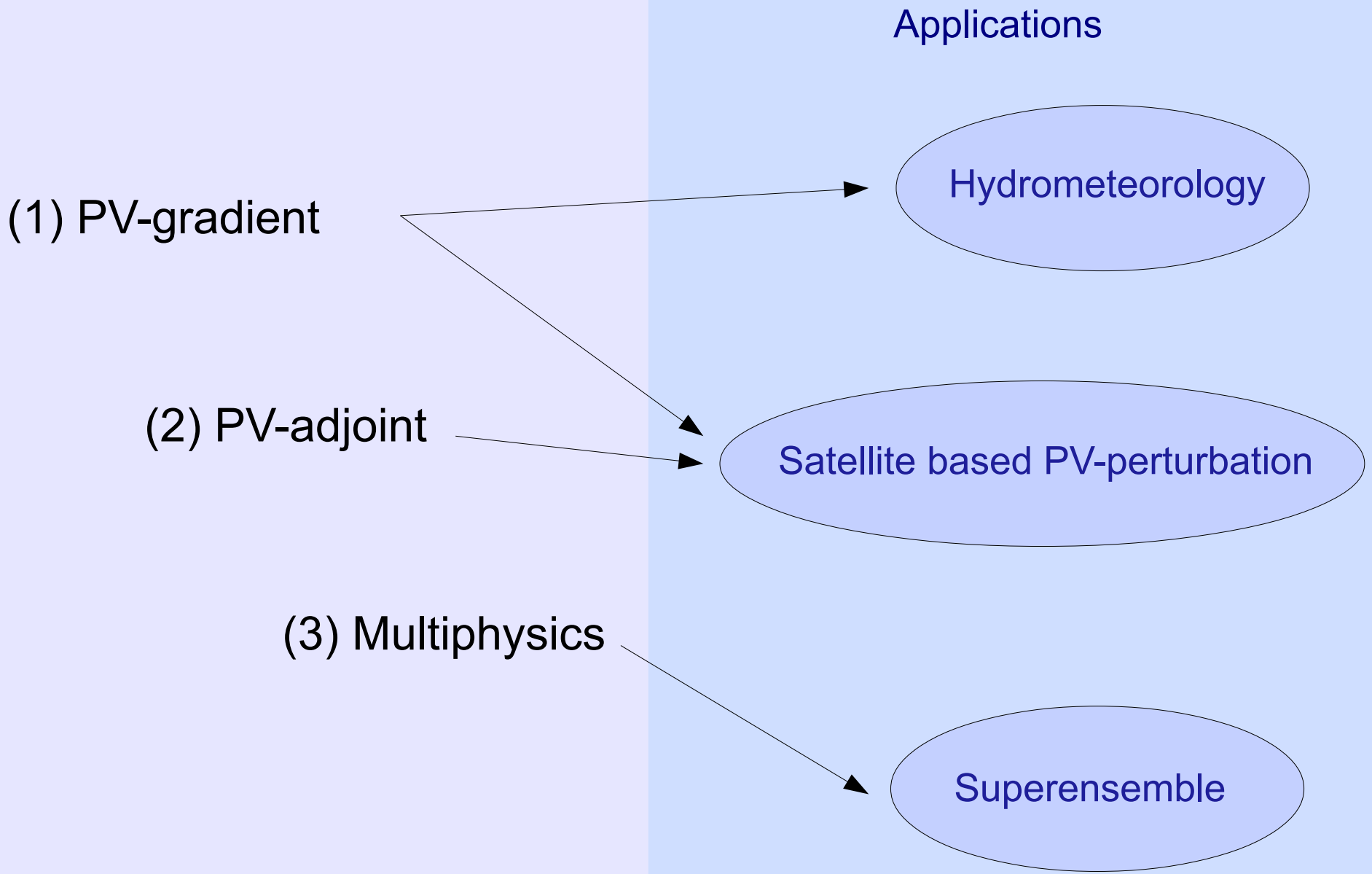




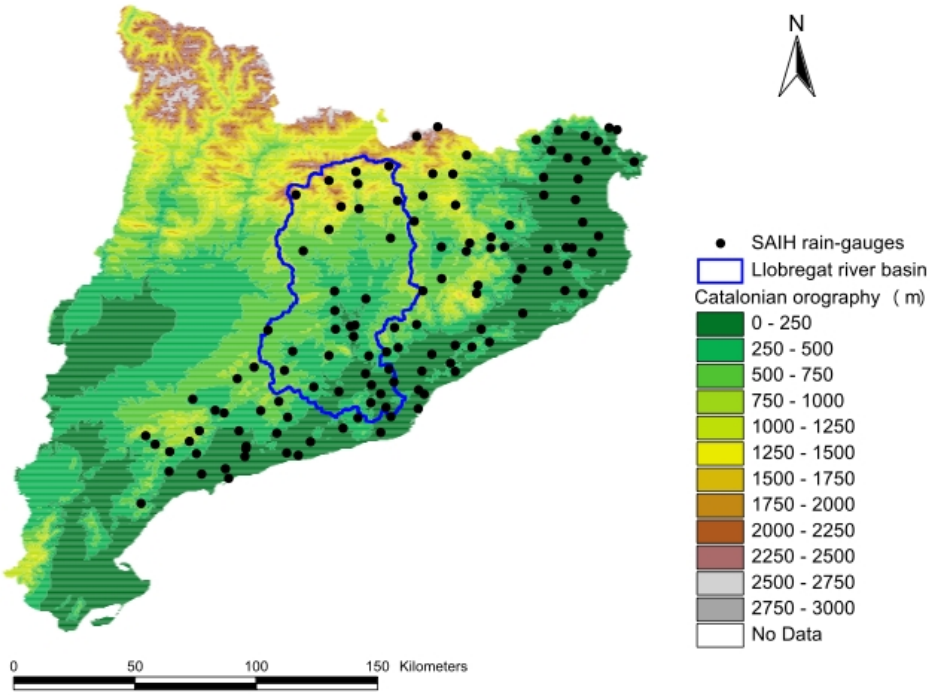


Rank Historgram




Applications
(1) PV-gradient
(2) PV-adjoint
(3) Multiphysics
Hydrometeorology
Satellite based PV-perturbation
Superensemble

Impact of PV uncertainties into hydrometeorological forecasts



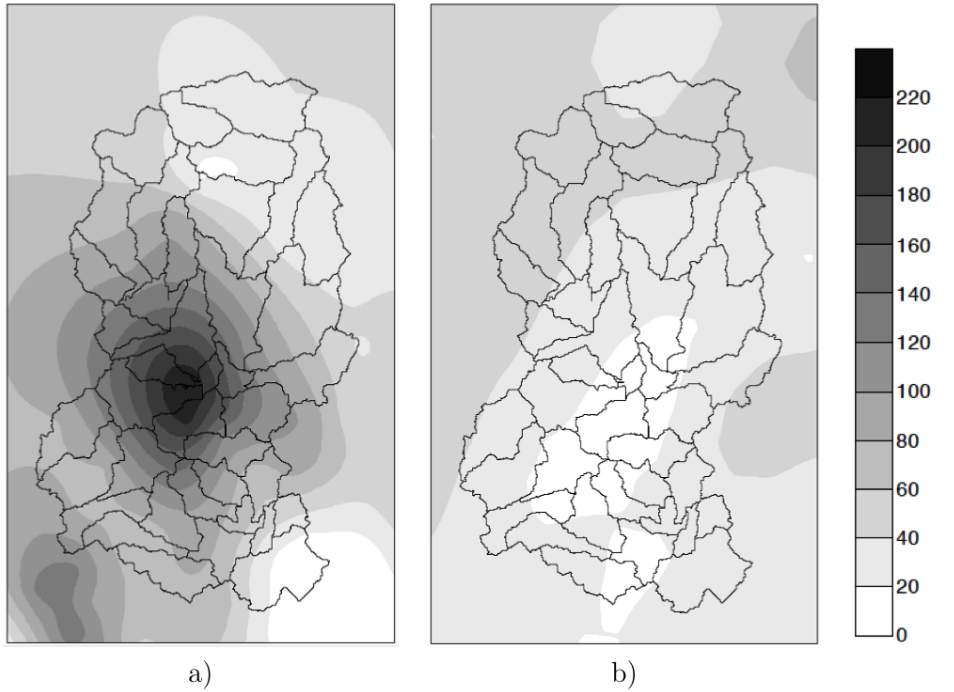
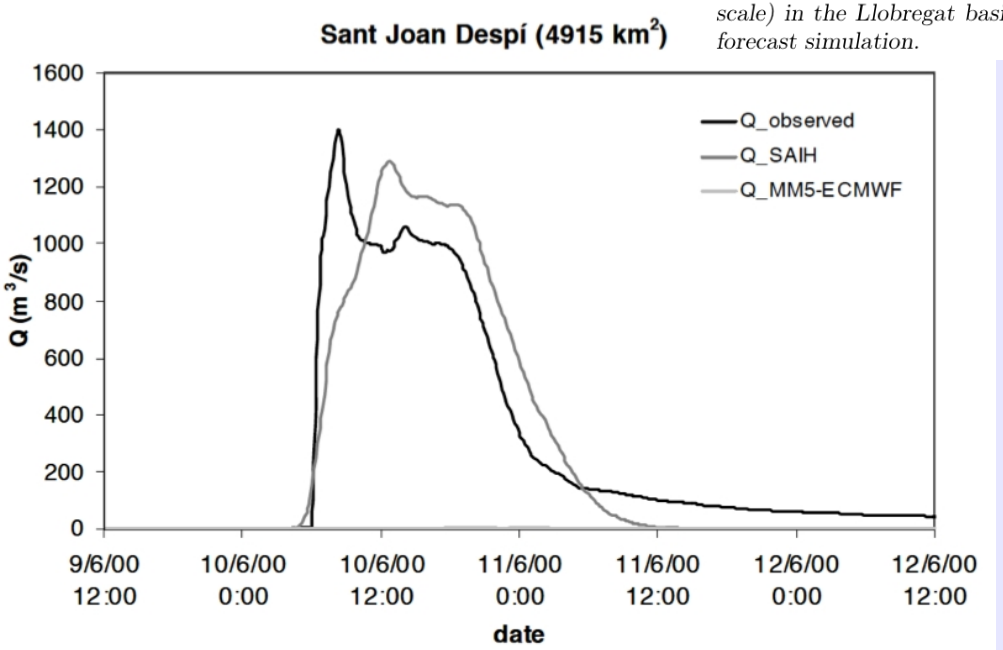


Figure 10.5. *Spatial distribution of the accumulated precipitation (in mm according to the scale) in the Llobregat basin for 9-10 June 2000 episodes: a) Observed and b) MM5 control forecast simulation.*



Impact of PV uncertainties into hydrometeorological forecasts

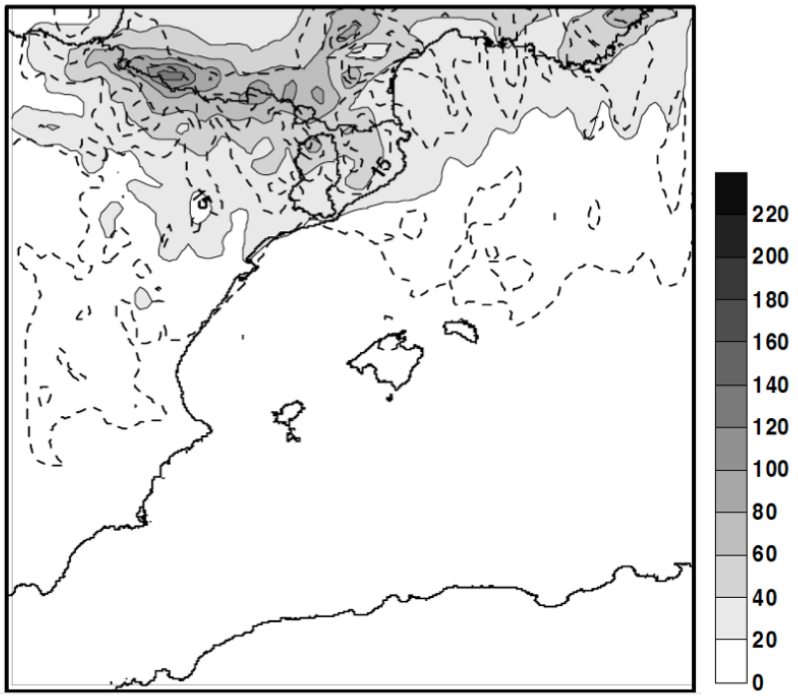
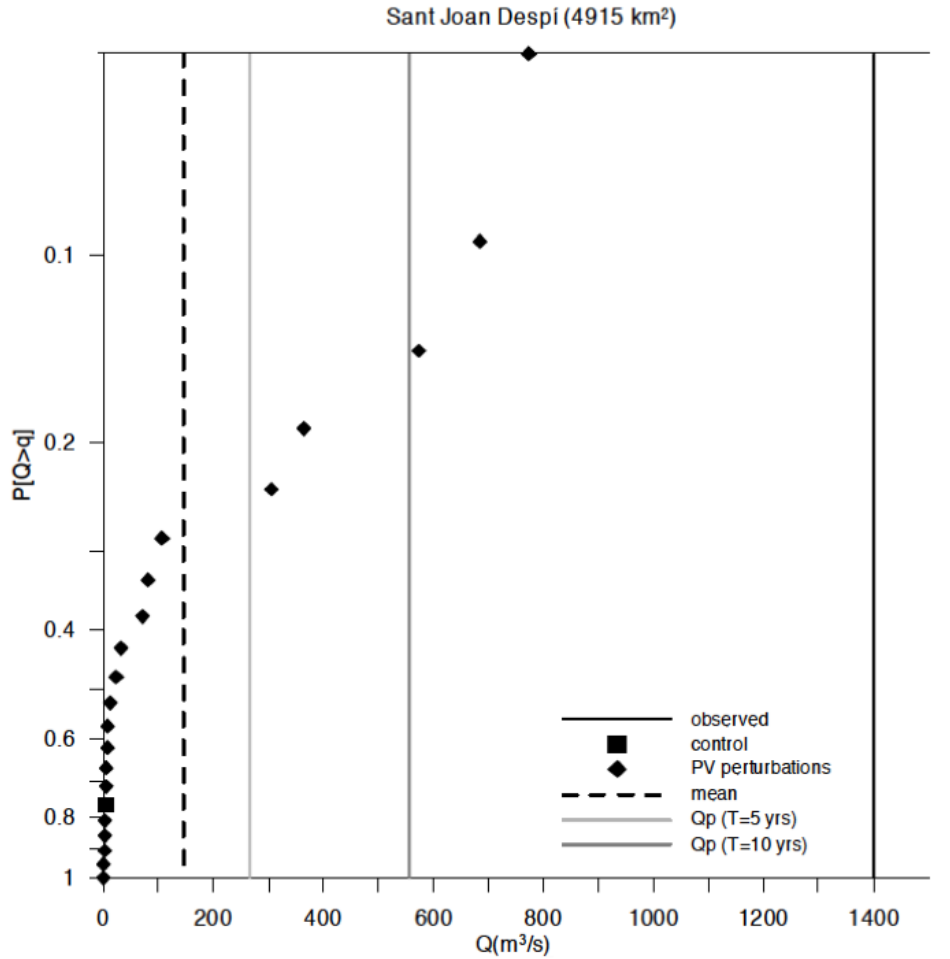
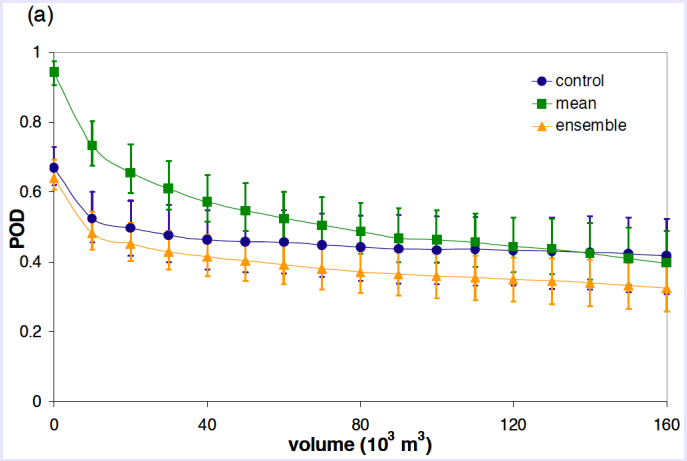
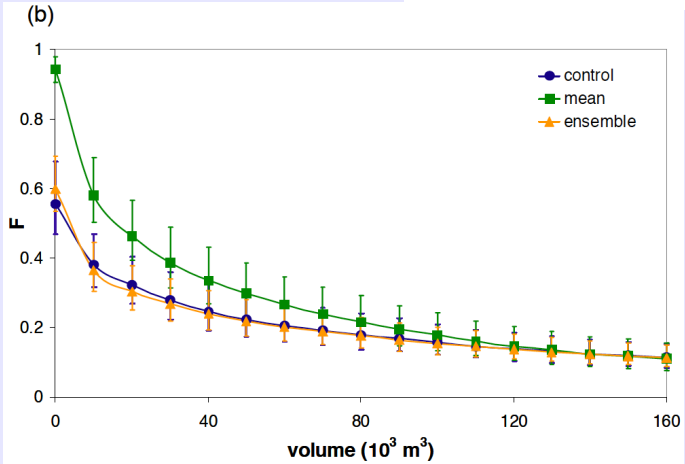
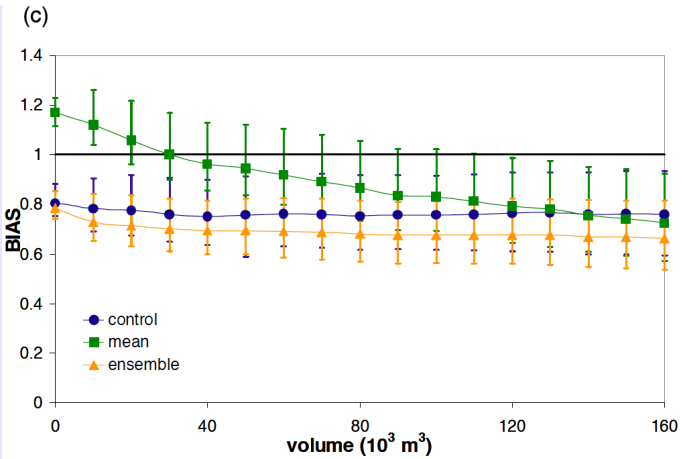


Figure 10.7. *Ensemble mean (shaded contours, in mm) and ensemble standard deviation (dashed line, in mm at 7.5mm intervals) for the accumulated precipitation over the second MM5 computational domain for the 9-10 June 2000 event. The Llobregat river basin is highlighted as thick line.*

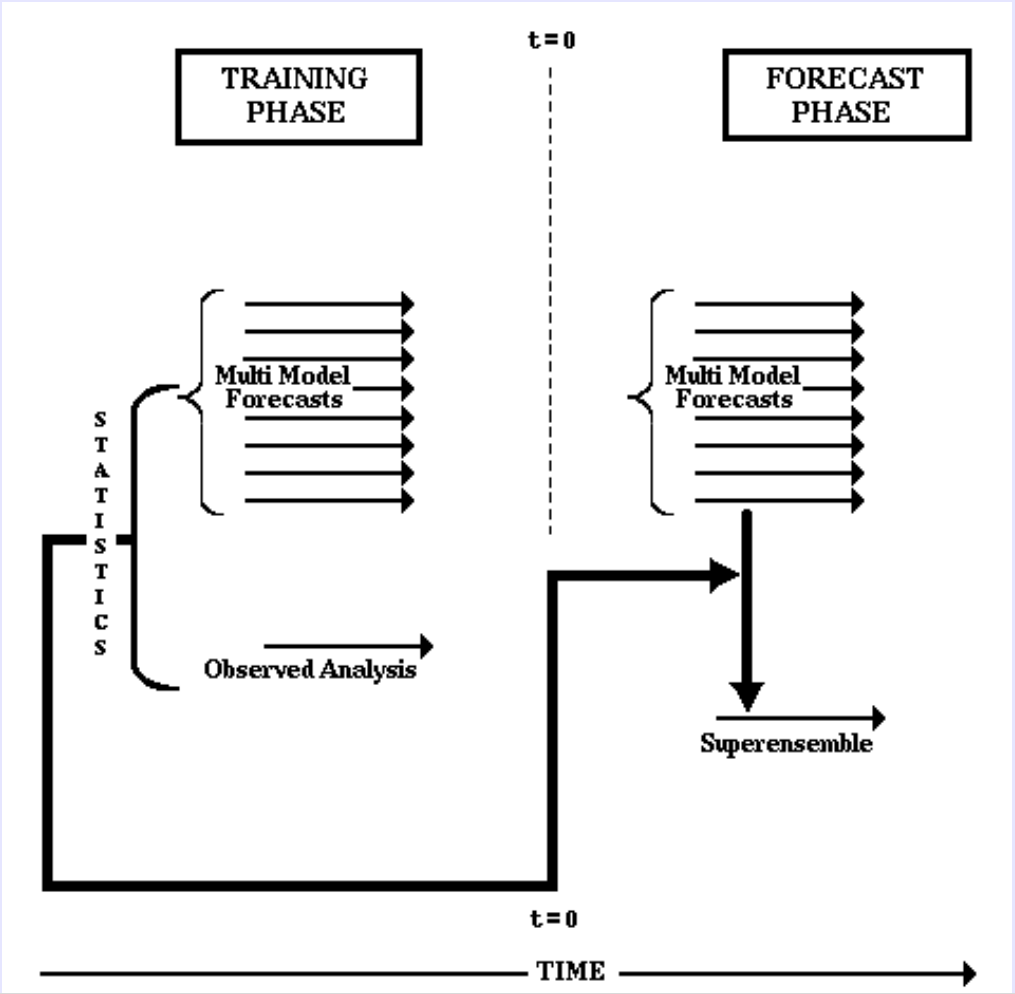








Superensemble

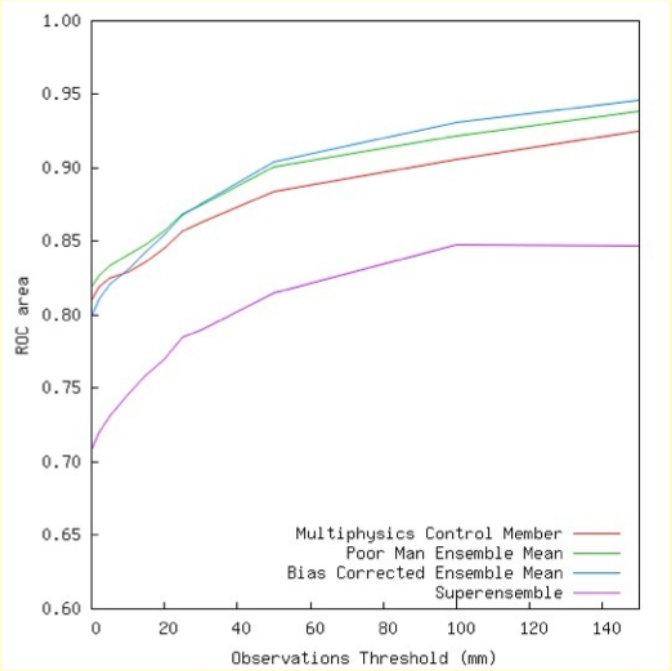


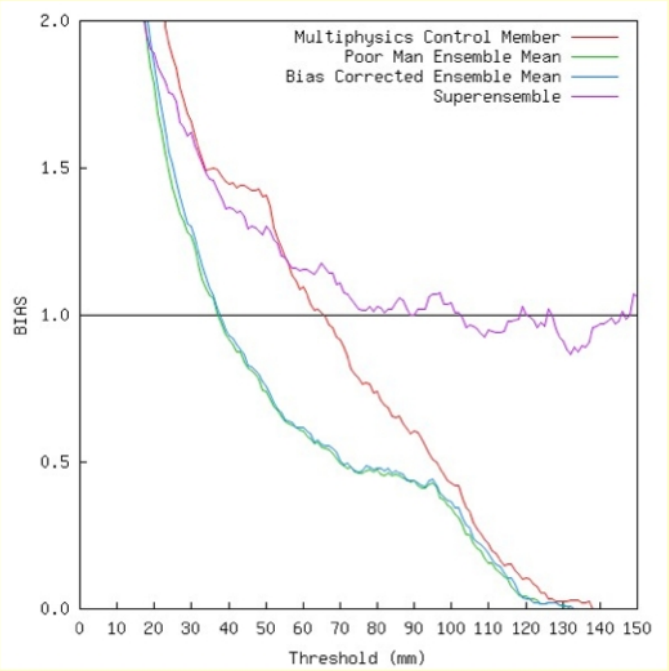
- Training phase:
  4 months (September - December 2001)

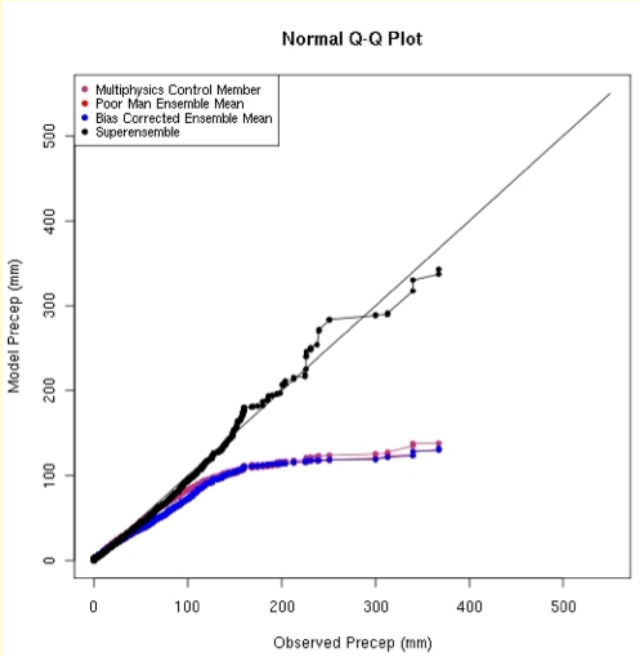
- Forecast phase:
  56 days (19 MEDEX cyclones associated with heavy rain precipitation)

Superensemble

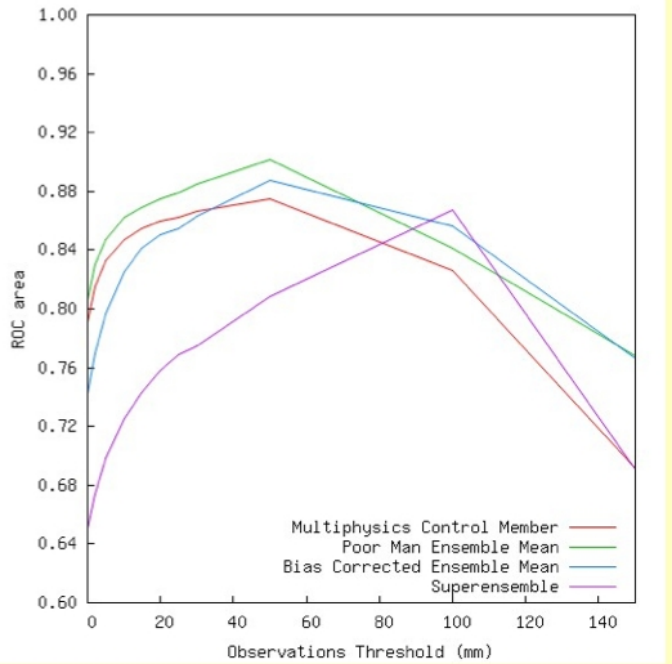
Training: 4 months Forecast: MEDEX

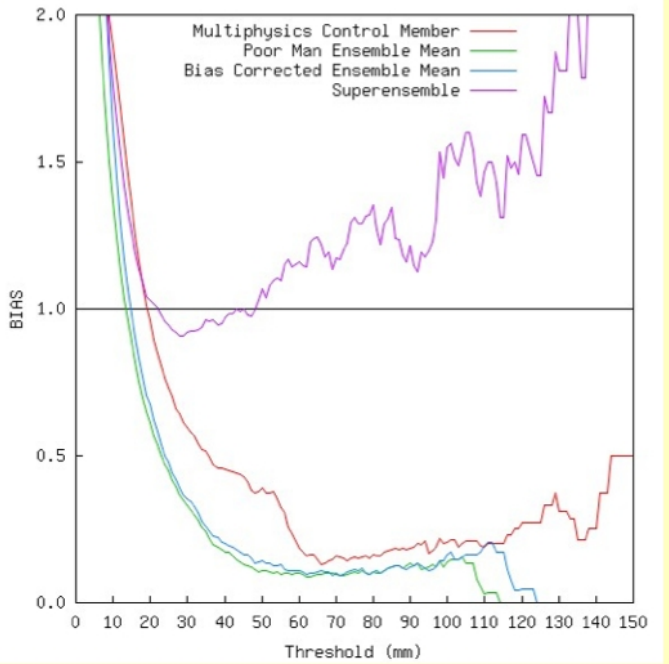


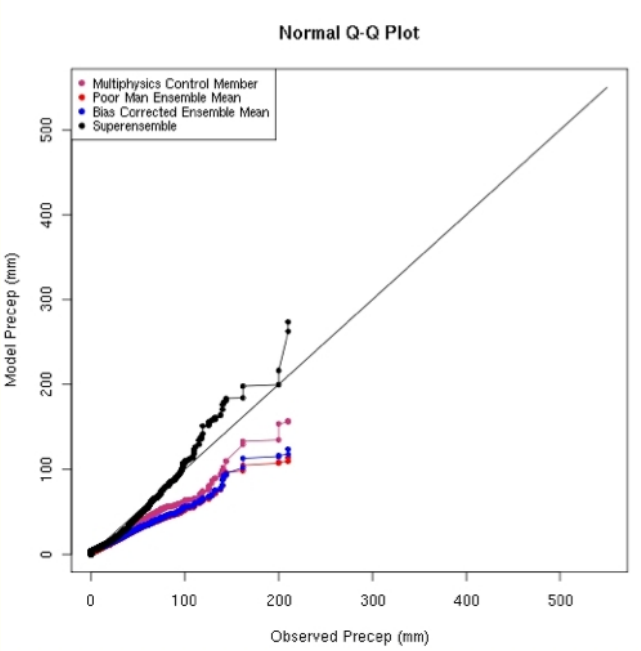




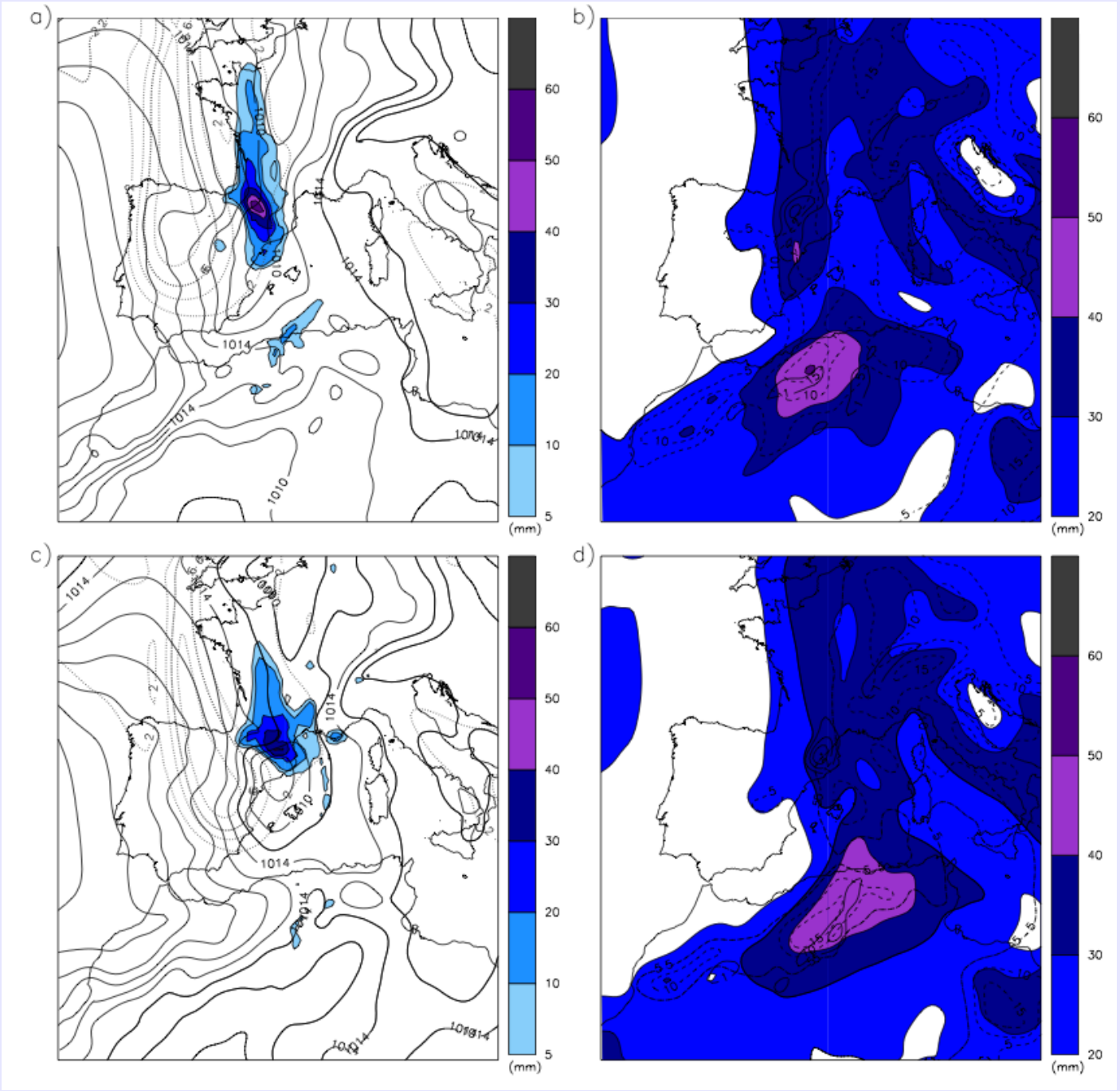
Training: MEDEX Forecast: 4months



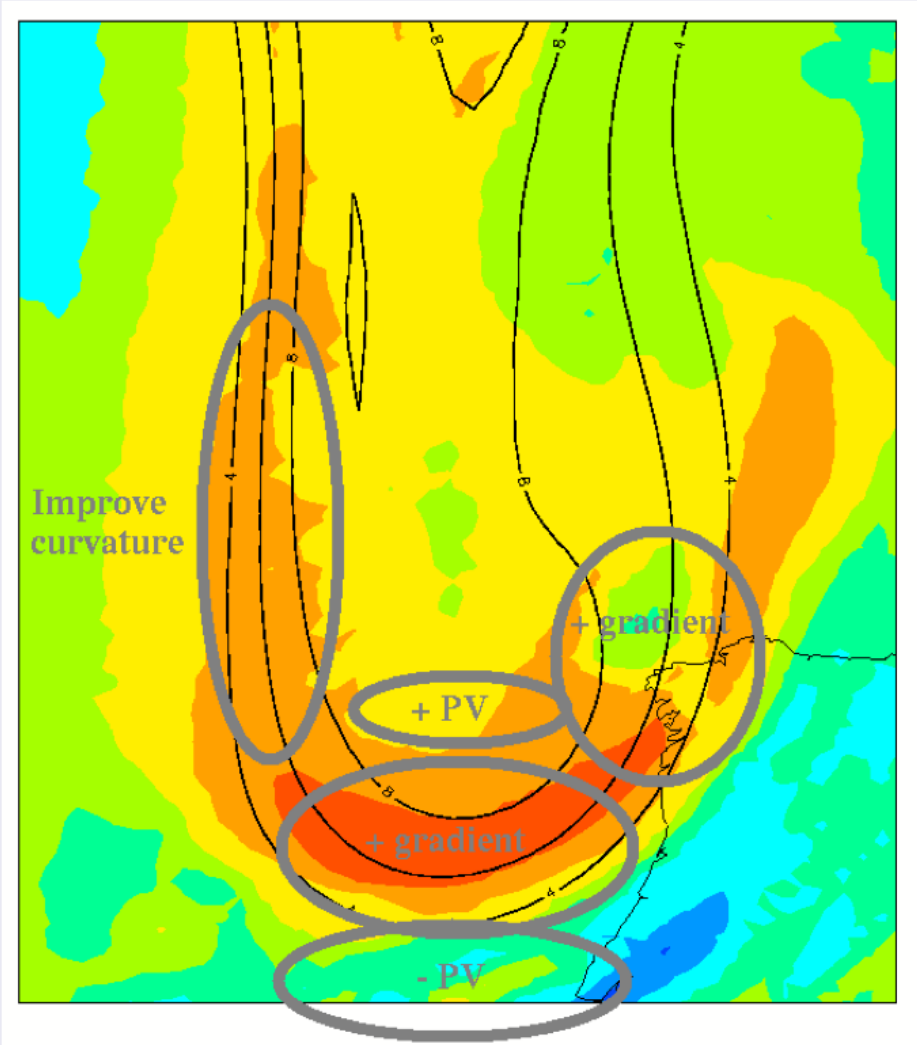




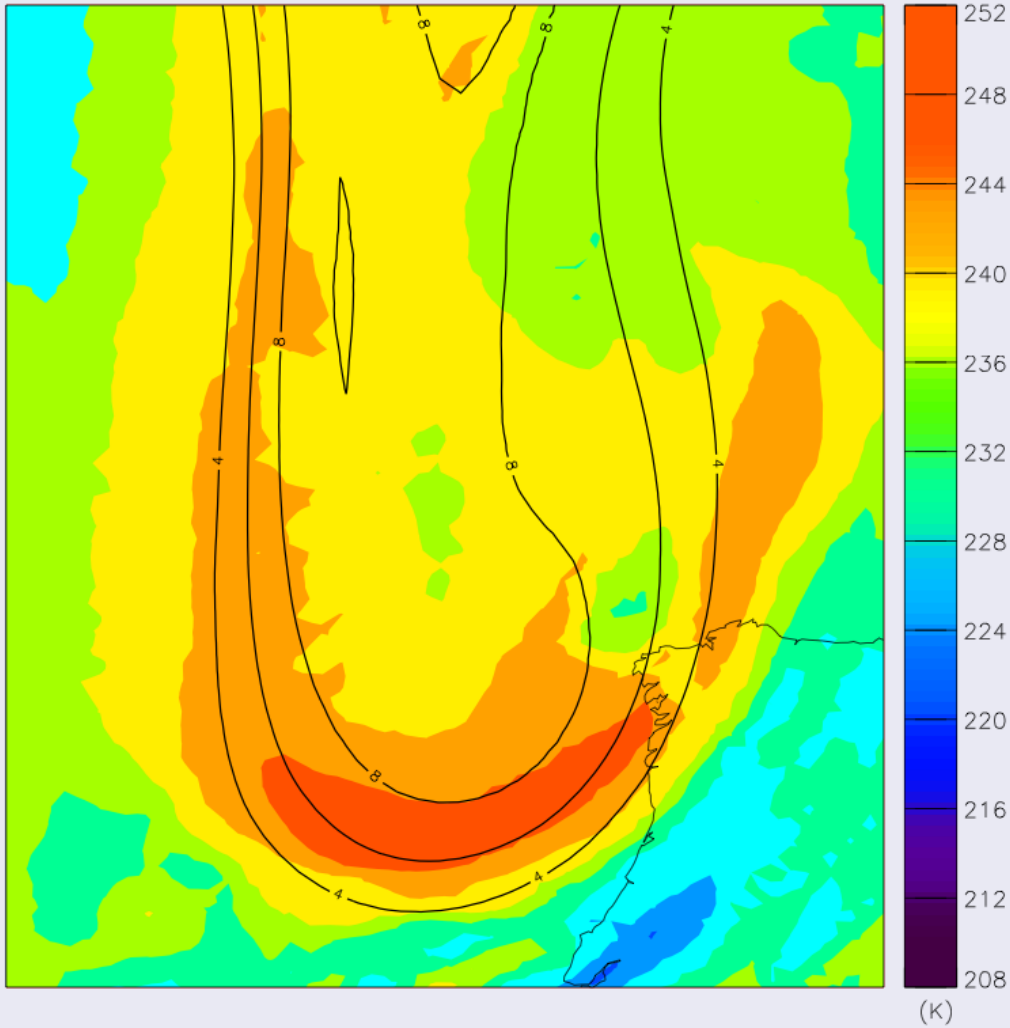
PV modifications based on Water Vapor brightness temperature



PV modifications based on Water Vapor brightness temperature



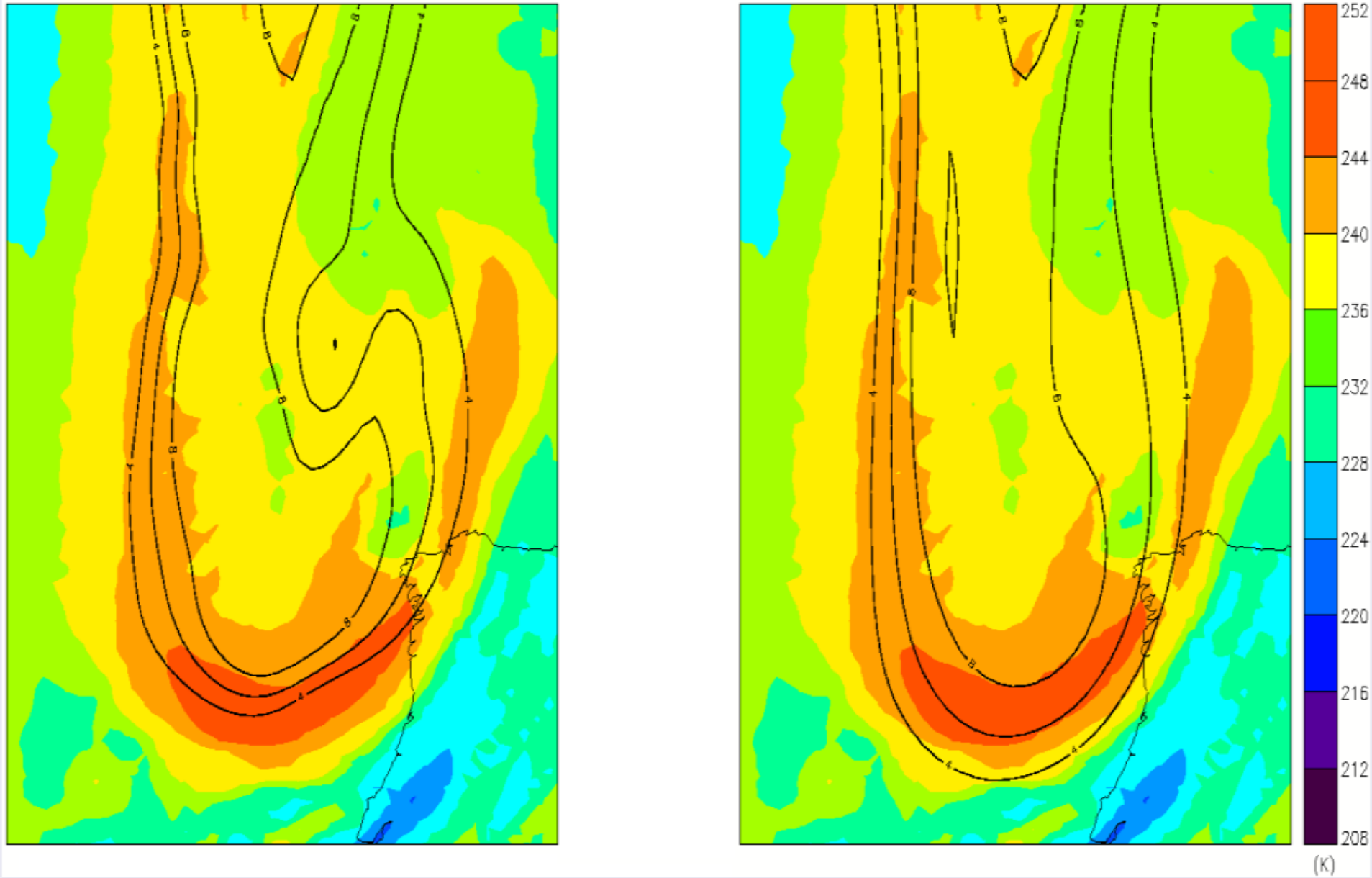
What we want



What we have

PV modifications based on Water Vapor brightness temperature

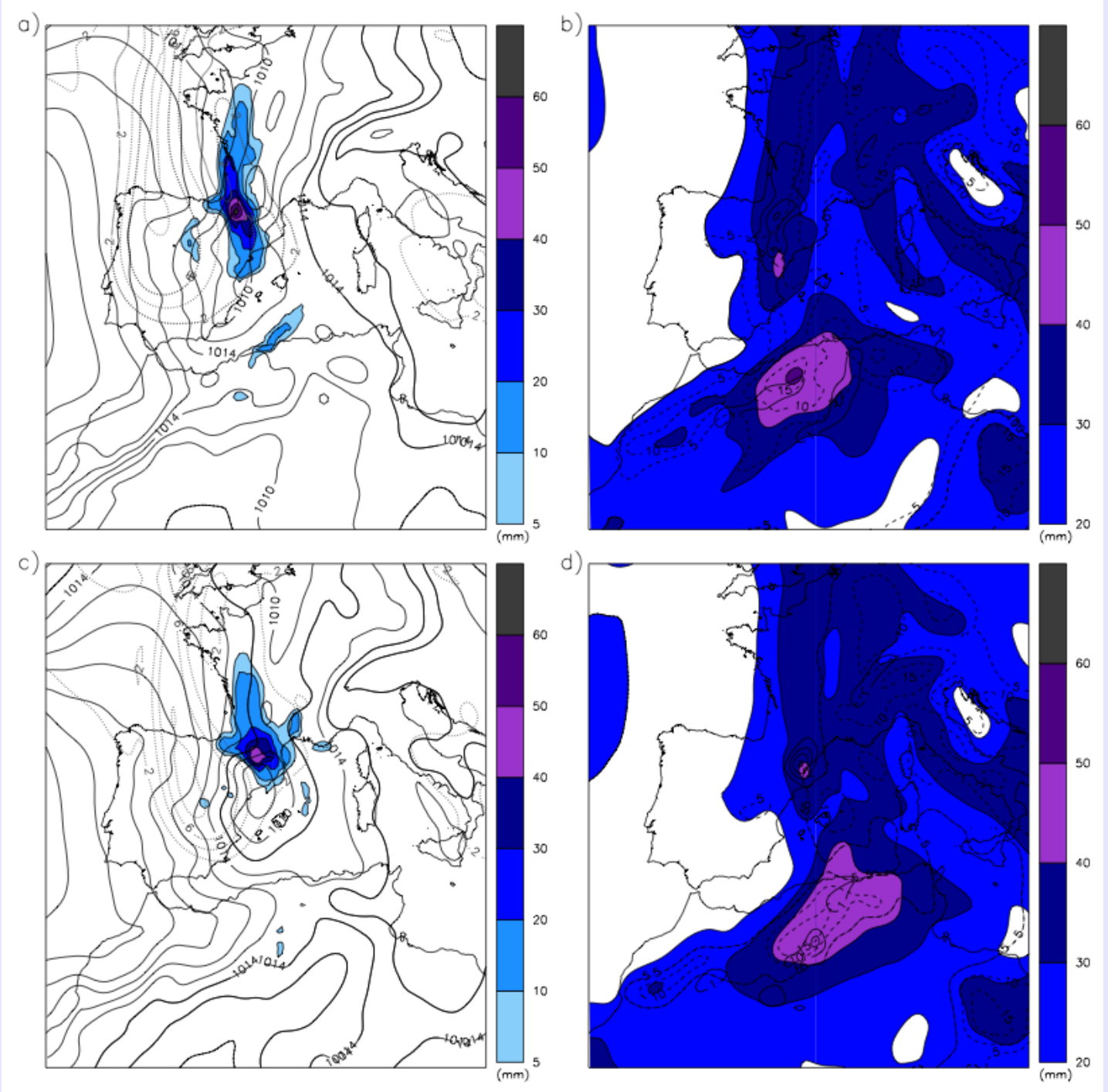
What we've got:



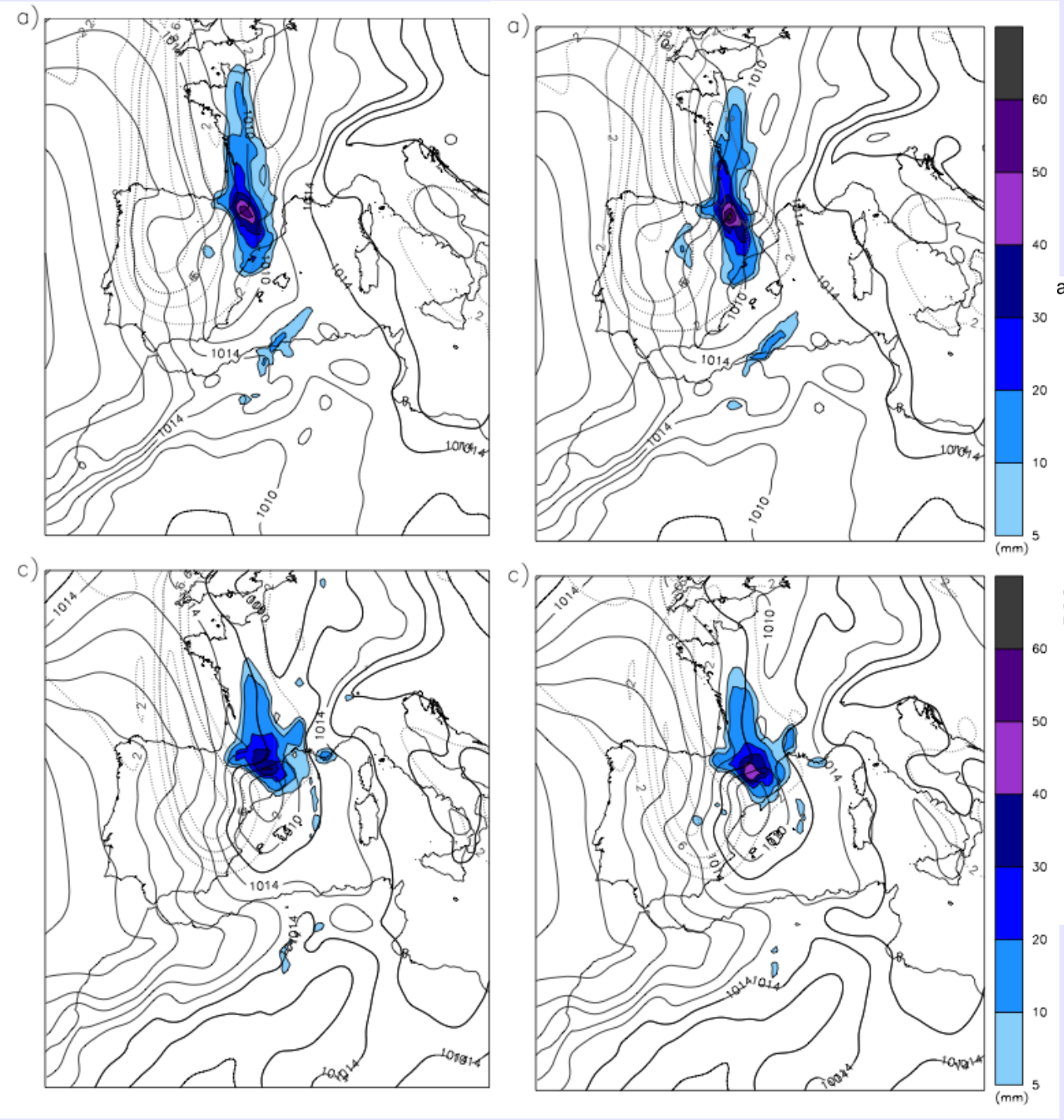
Perturbed

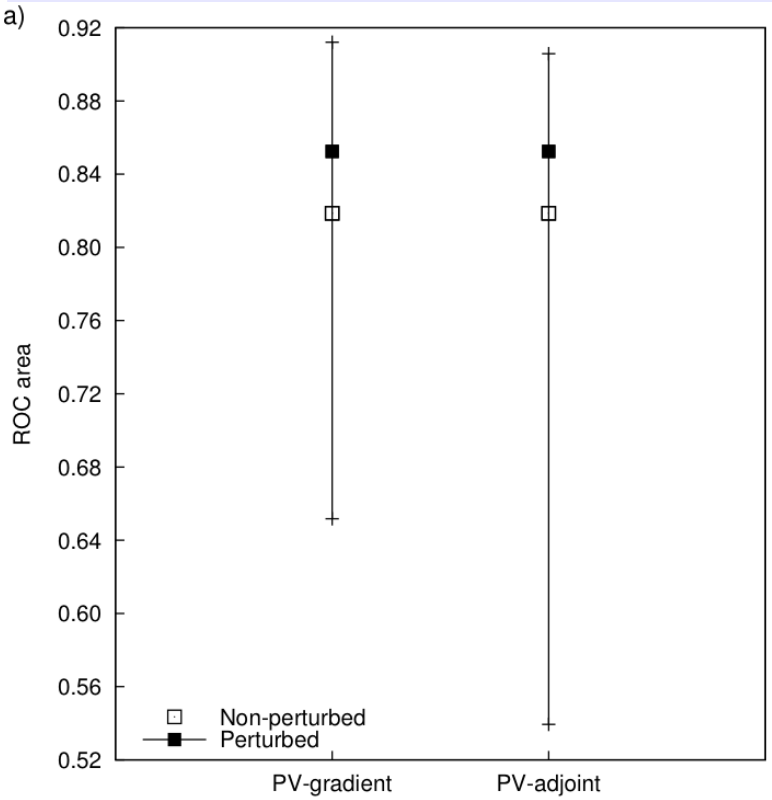
Non-perturbed

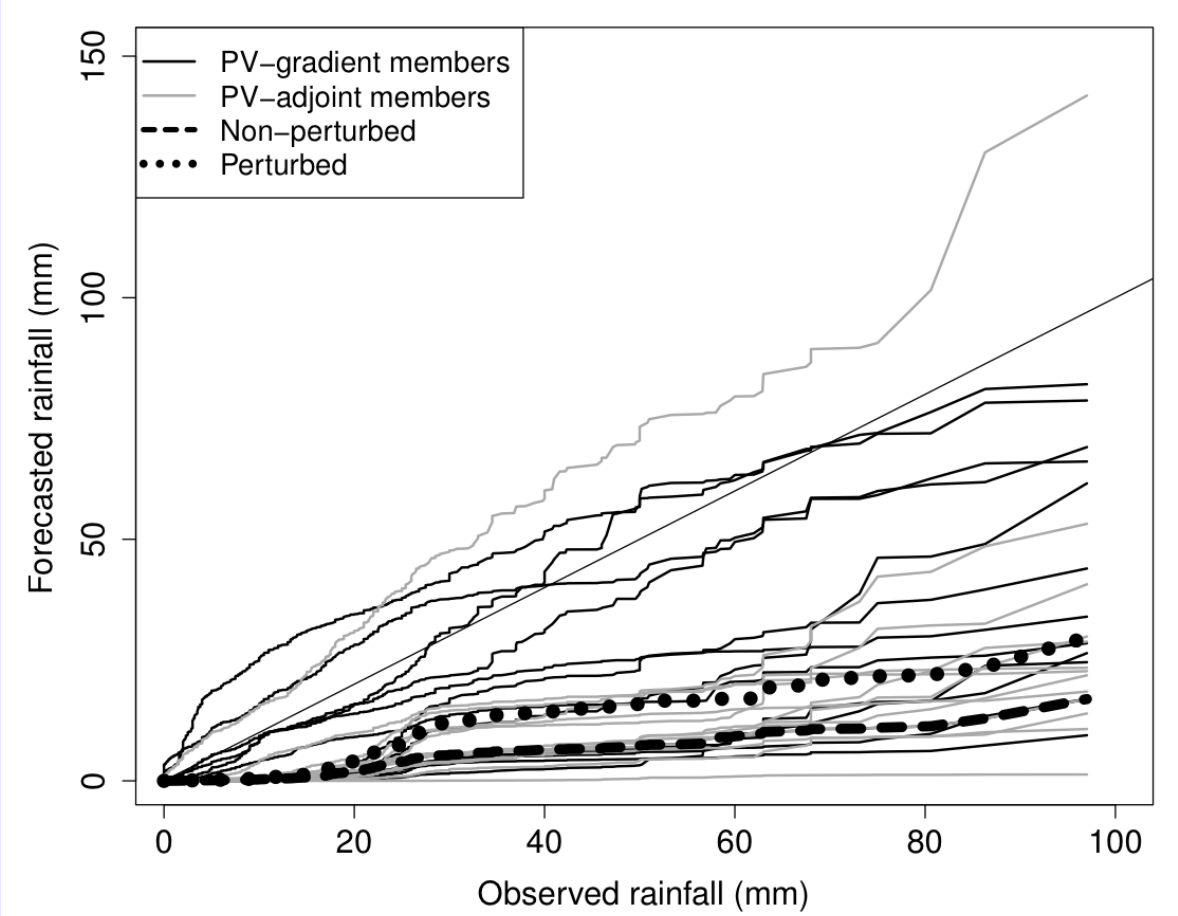
PV modifications based on Water Vapor brightness temperature

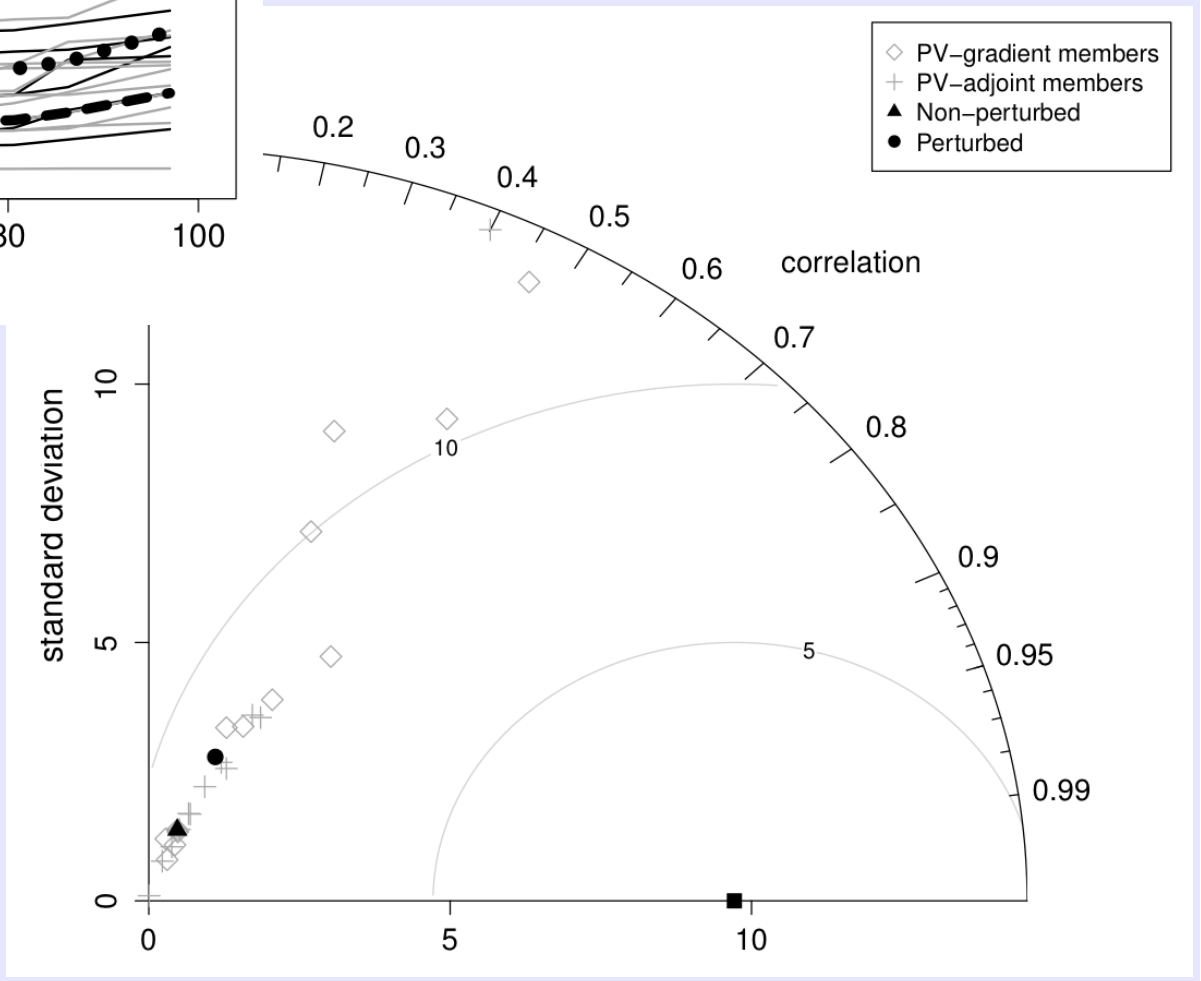


PV modifications based on Water Vapor brightness temperature






PV−gradient members
PV−adjoint members
Non−perturbed
Perturbed
Forecasted rainfall (mm)
Observed rainfall (mm)
0
50
100
150
0
20
40
60
80
100


PV−gradient members
PV−adjoint members
Non−perturbed
Perturbed
correlation
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0.95
0.99
standard deviation
0
5
10
10
5
0
5
10