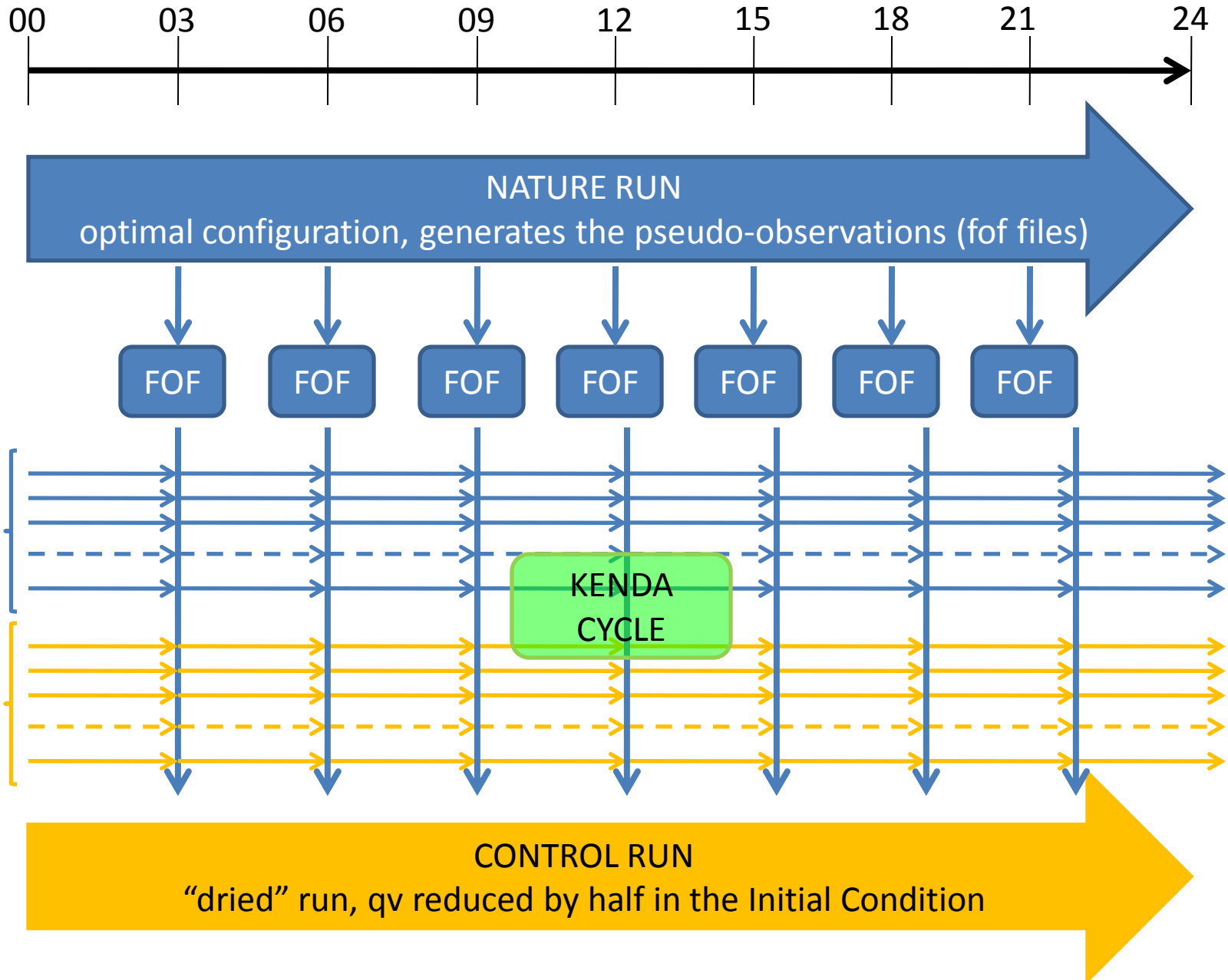


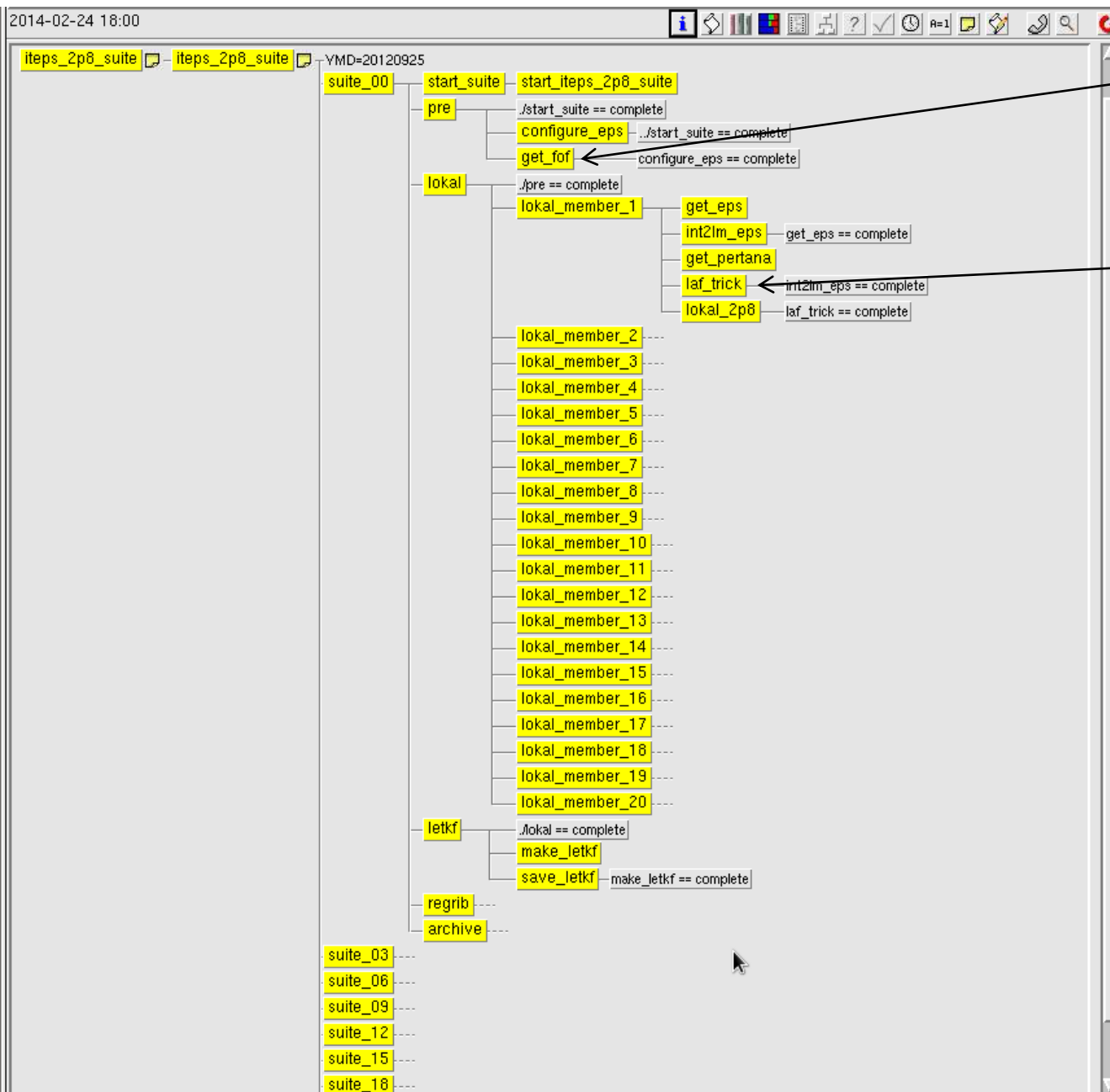
Experience with KENDA at ARPA-SIMC - first OSSE results

Chiara Marsigli and Tiziana Paccagnella
ARPA-SIMC

OSSE set-up



KENDA OSSE suite at ECMWF



get fof from nature run
(psuedo-observations)

modification of the IC
(like in the control run)
only for members 1-10

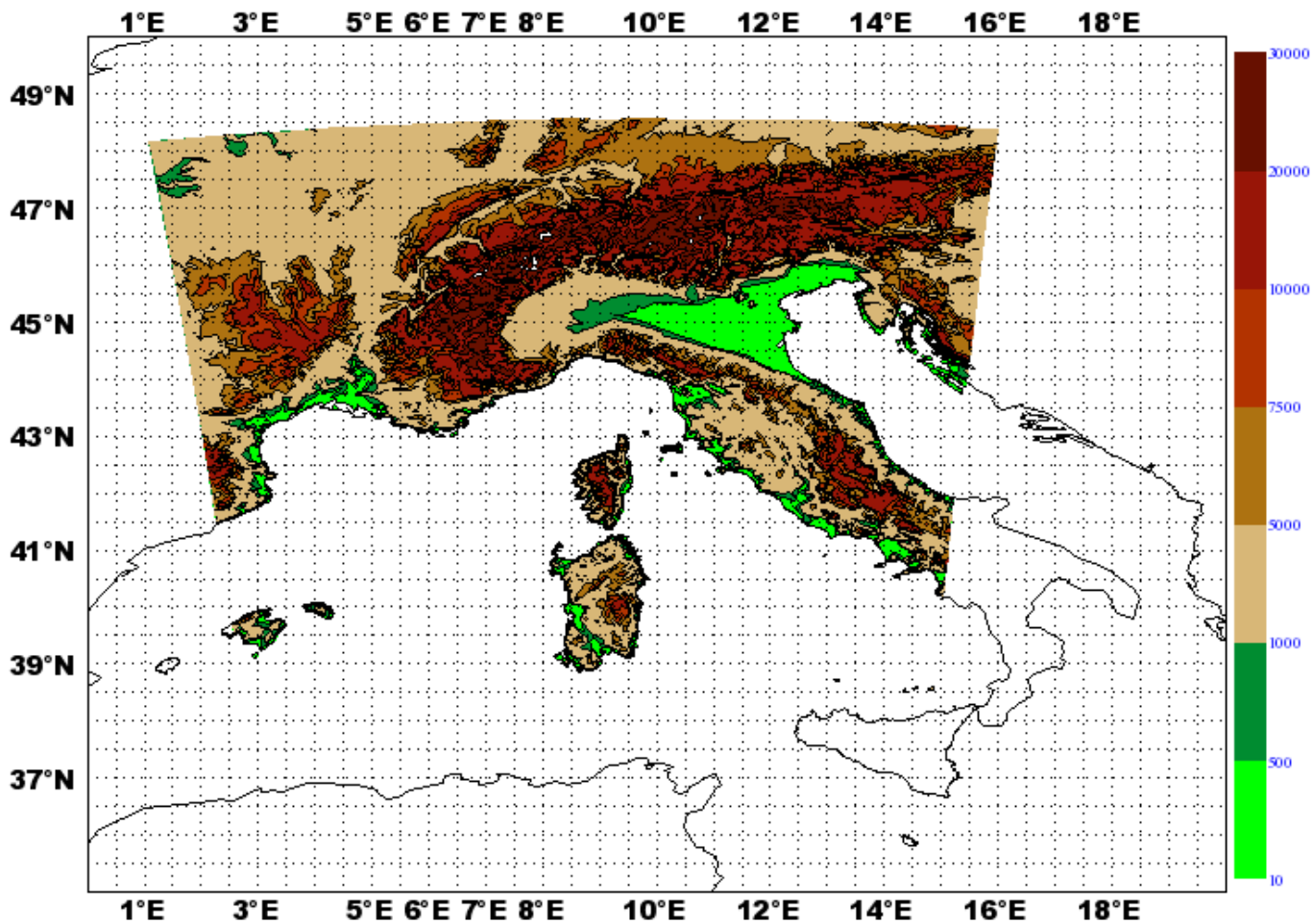
Execution of:

- Nature run
 - Control run
 - KENDA OSSE
- is driven by the specification in the .def file (file for the definition of the sms suite)

Set-up of the experiments

- KENDA cycle:
 - 3-hourly cycles, 24 hours
 - 20 members
 - BCs from ECMWF ENS (also ICs for cold start)
 - no model perturbations
 - observations: TEMP SYNOP AIREP
 - COSMO 2.8 km 50 levels

domain (COSMO 2.8 km)



Localisation experiments

- qv is halved (50% of the original value) at all model levels (50 model levels) in the initial conditions only (not in the BCs)
- loc100 experiment:
 - lh=100 (adap_loc=F), lv=0.3
 - qv halved only in members 1-10 (ICs of members 11-20 are untouched)
- loc50 experiment:
 - lh=50 (adap_loc=F), lv=0.3
 - qv halved in members 1-10
- lh02 experiment:
 - lh=100 (adap_loc=F), lv=0.2
 - qv halved in members 1-10

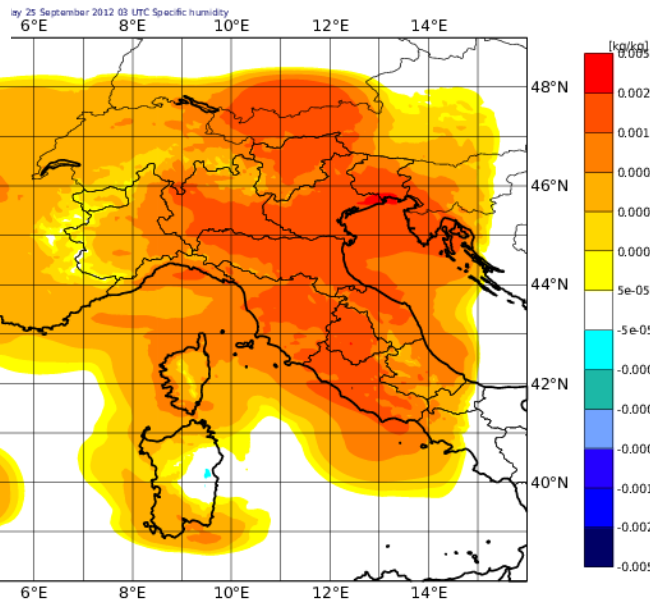
Spread experiments

- qv is halved (50% of the original value) at all model levels (50 model levels) in the initial conditions only (not in the BCs)
- loc100 **5**IC50 experiment:
 - lh=100 (adap_loc=F), lv=0.3
 - qv halved in members **1-5**
- loc100 **15**IC50 experiment:
 - lh=100 (adap_loc=F), lv=0.3
 - qv halved in members **1-15**
- loc100 **1**IC50 experiment:
 - lh=100 (adap_loc=F), lv=0.3
 - qv halved in member **1**
- loc100 **19**IC50 experiment:
 - lh=100 (adap_loc=F), lv=0.3
 - qv halved in members **1-19**

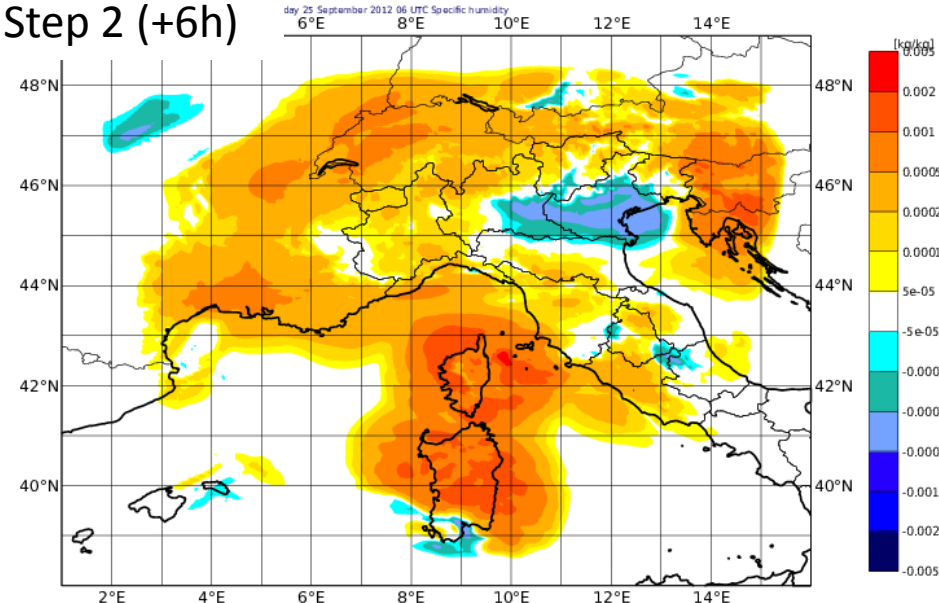
Example: OSSE loc50

analysis minus background – $qv@ML40$ (about 900hPa)

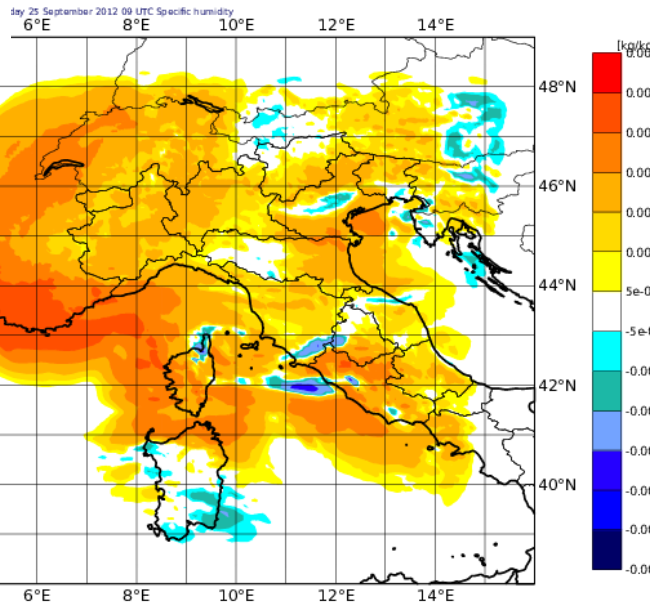
Step 1 (+3h)



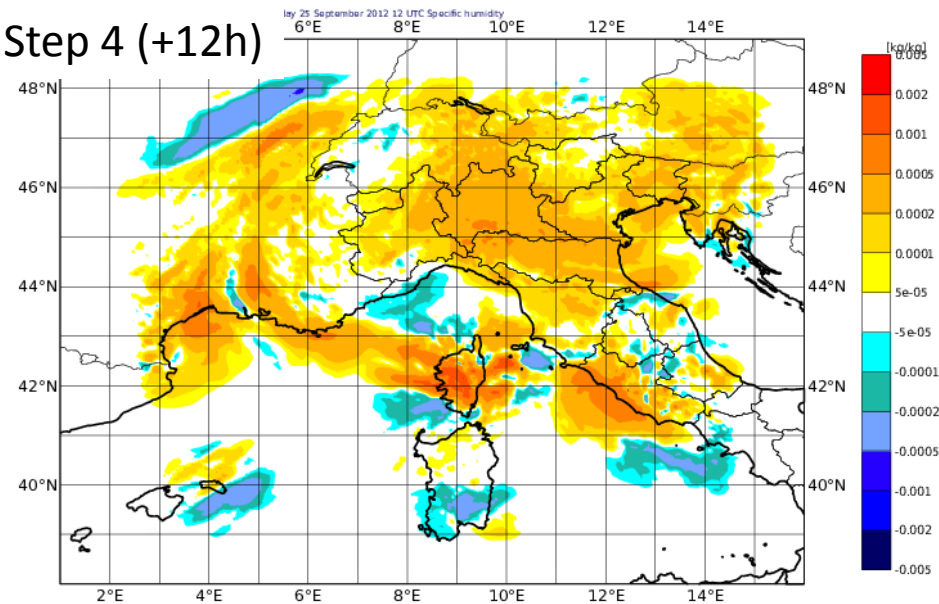
Step 2 (+6h)



Step 3 (+9h)



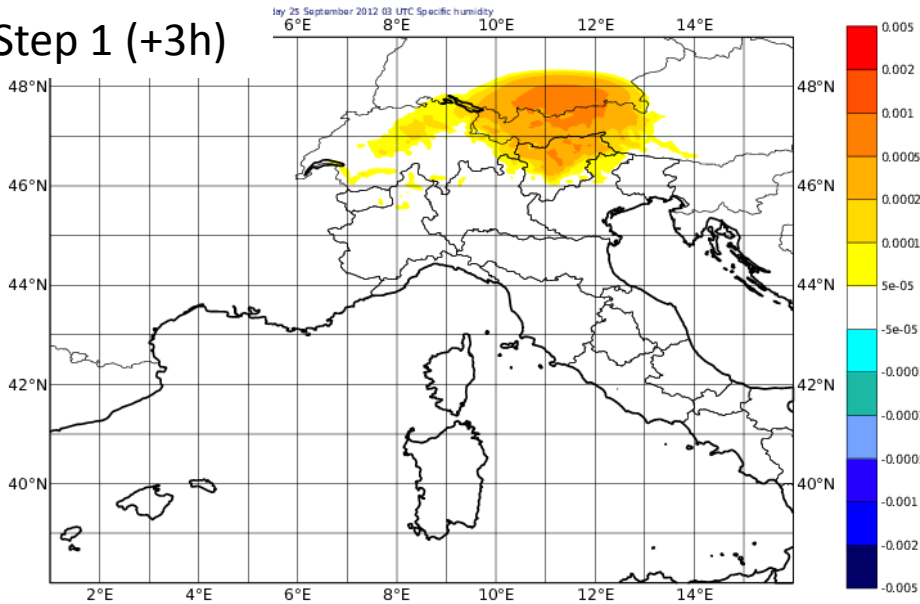
Step 4 (+12h)



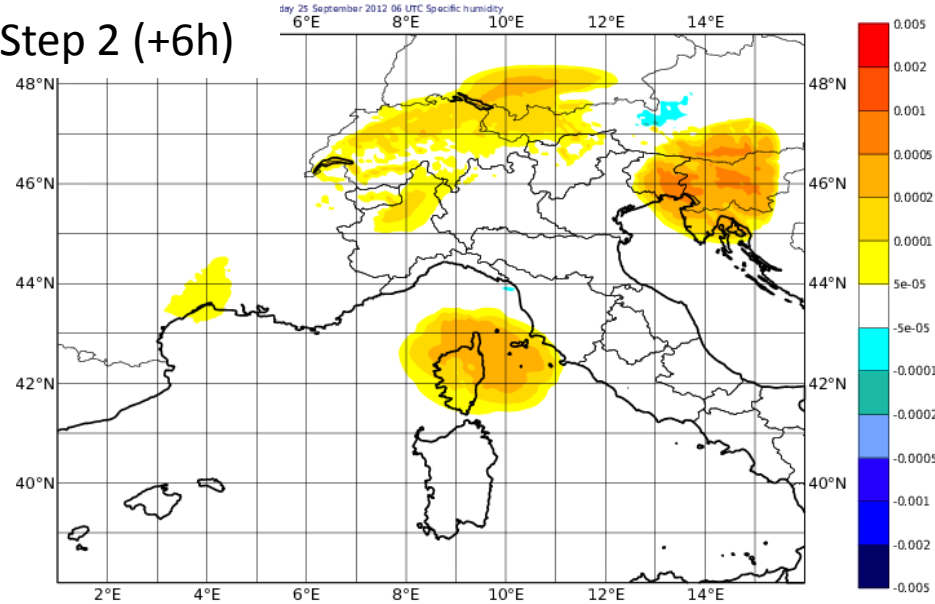
Example: OSSE loc50

analysis minus background – $qv@ML30$ (about 650hPa)

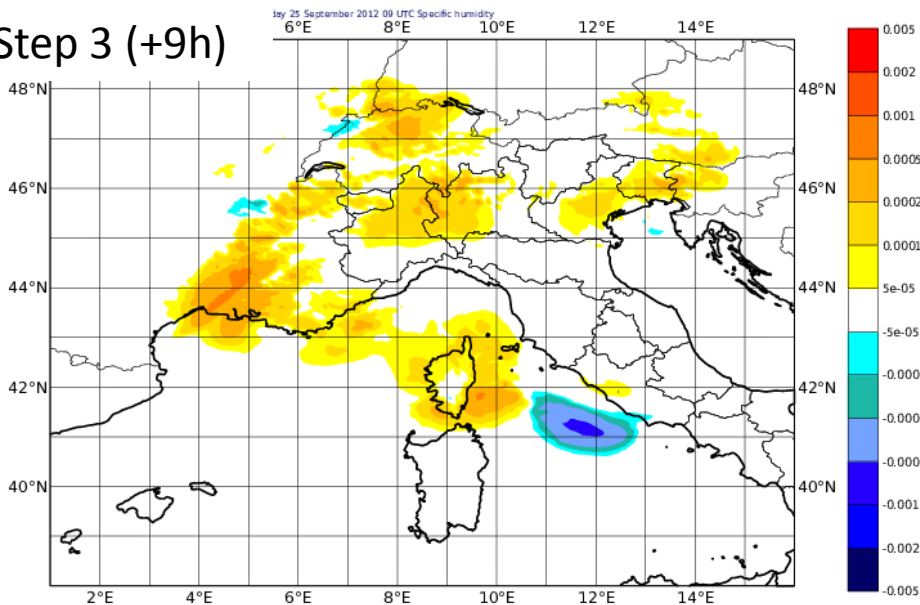
Step 1 (+3h)



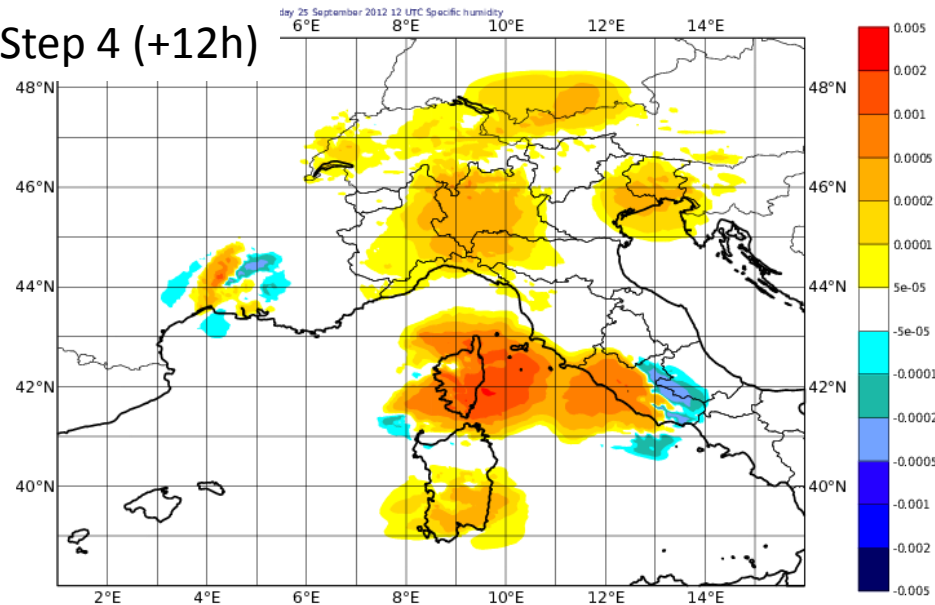
Step 2 (+6h)



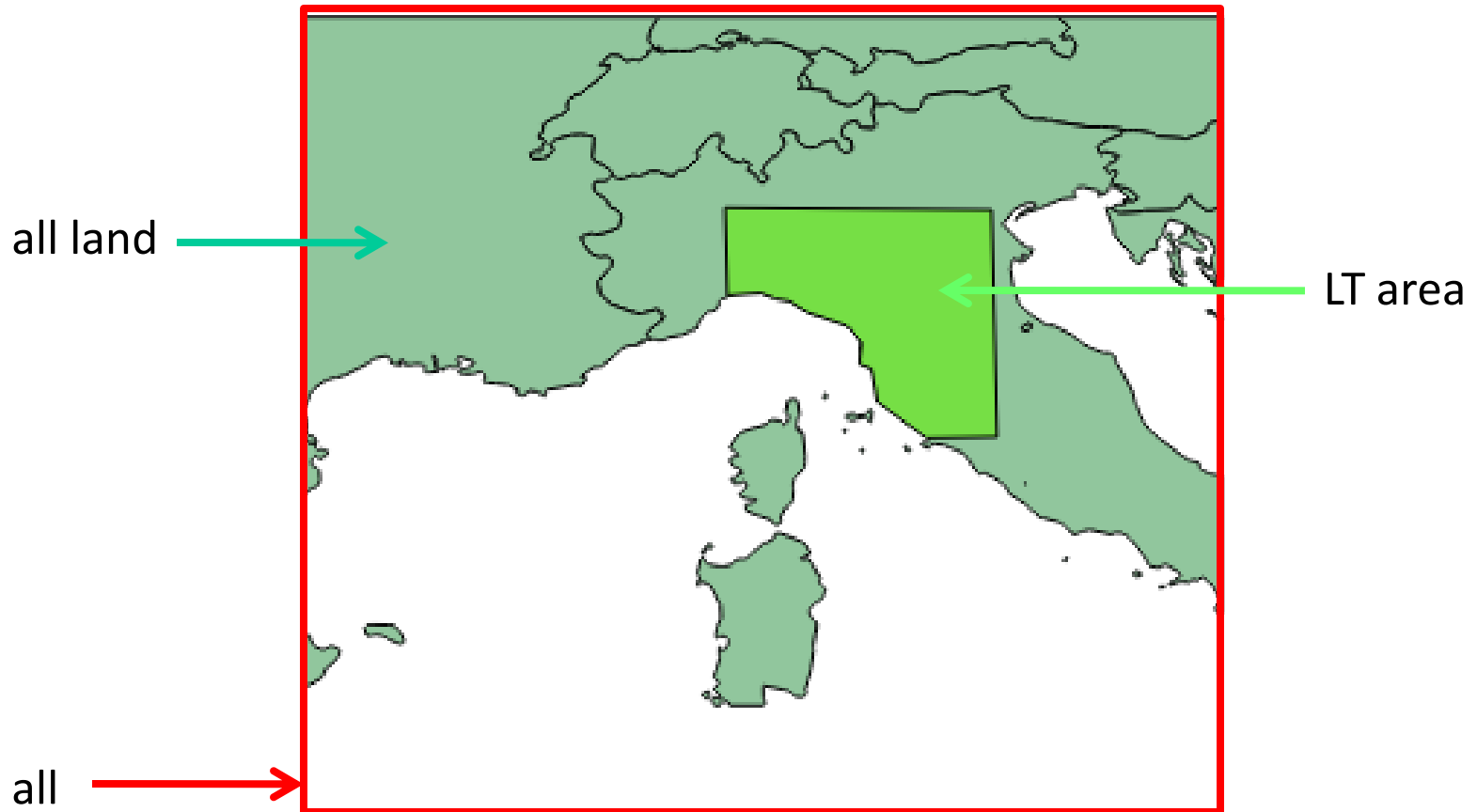
Step 3 (+9h)



Step 4 (+12h)



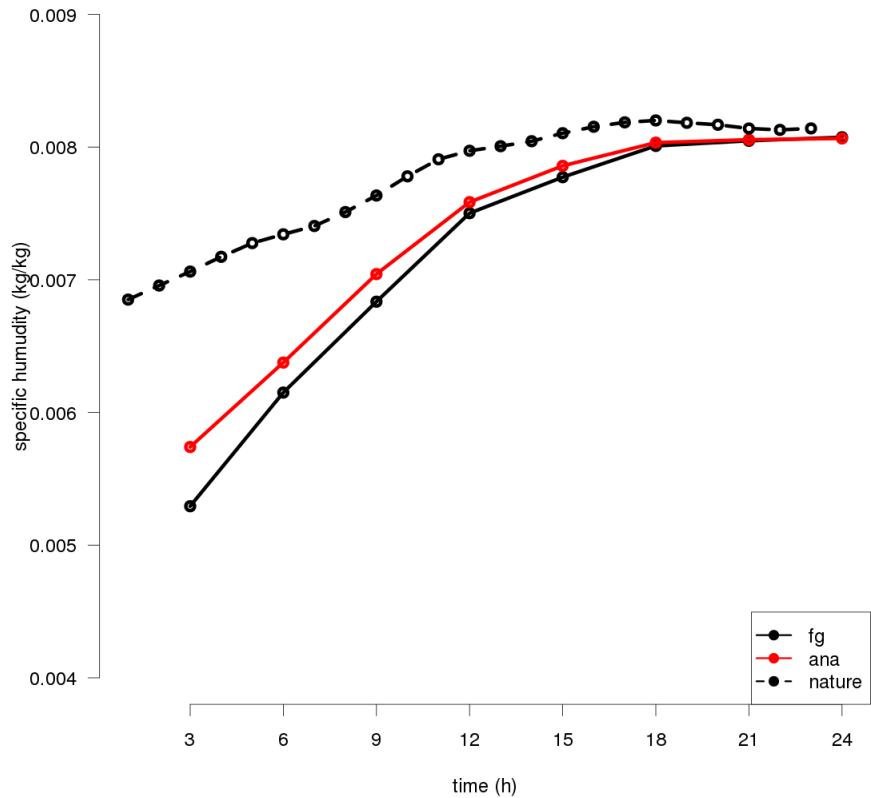
Shapefiles for qv averaging



OSSE

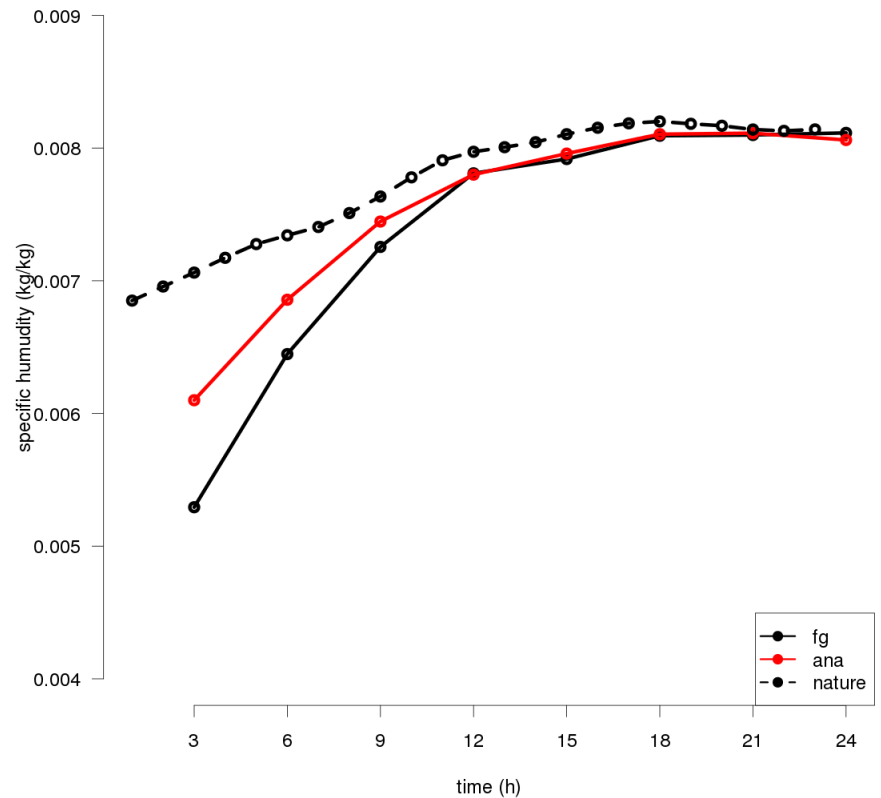
sensitivity to localisation

qv level 40 (about 900 hPa) - whole domain



loc50:

lh = 50 km



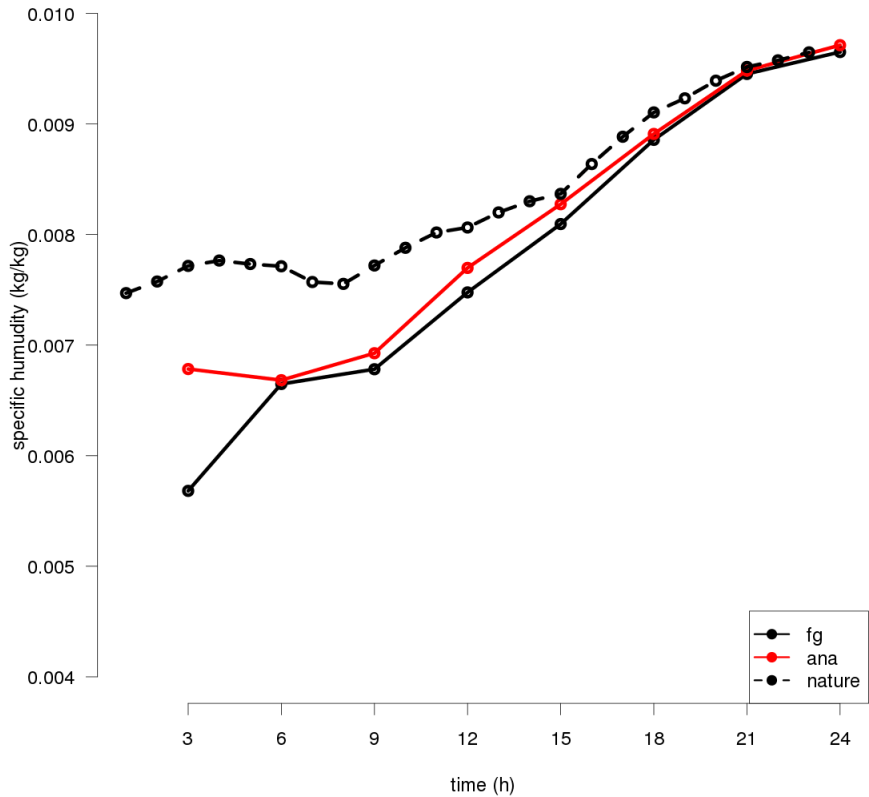
loc100:

lh = 100 km

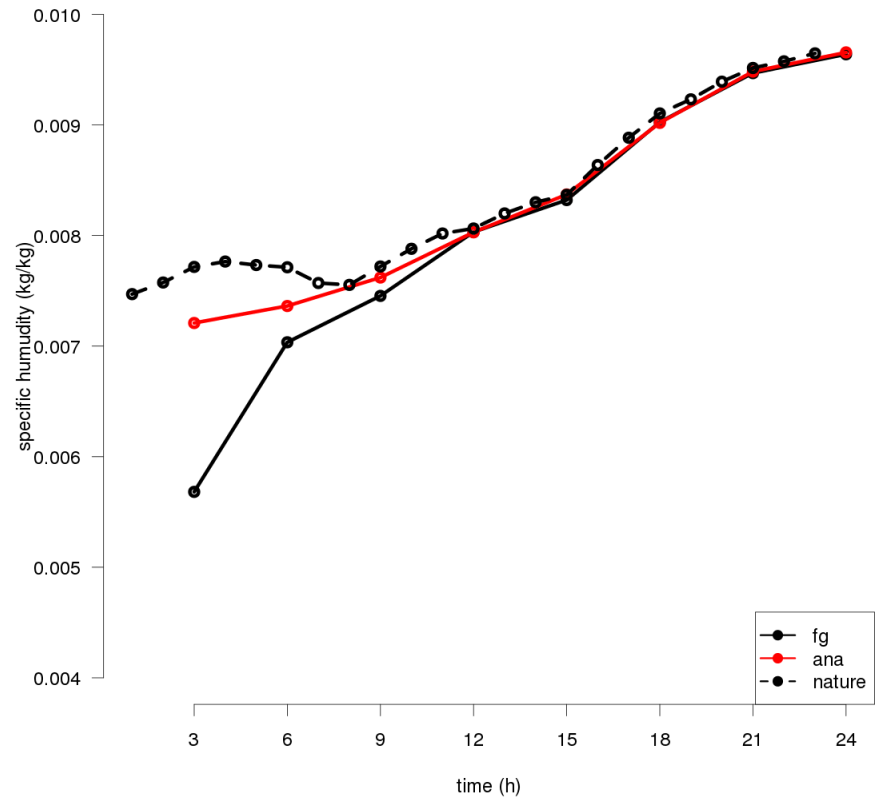
OSSE

sensitivity to localisation

qv level 40 (about 900 hPa) - Liguria-Tuscany area



loc50: lh = 50 km

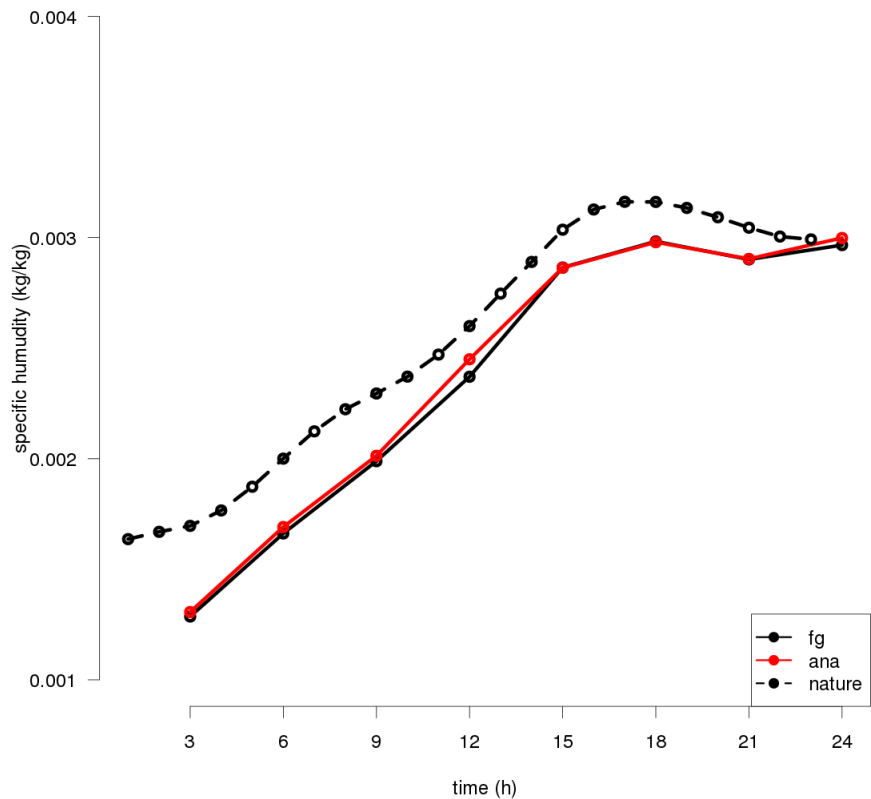


loc100: lh = 100 km

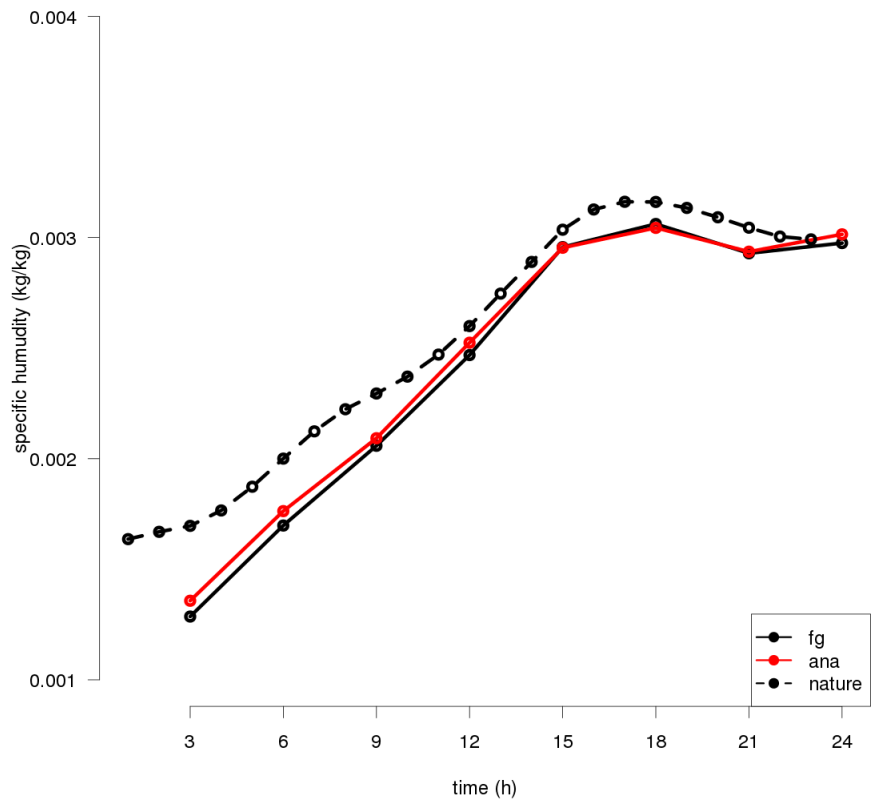
OSSE

sensitivity to localisation

qv level 30 (about 650 hPa) – whole domain



loc50: lh = 50 km

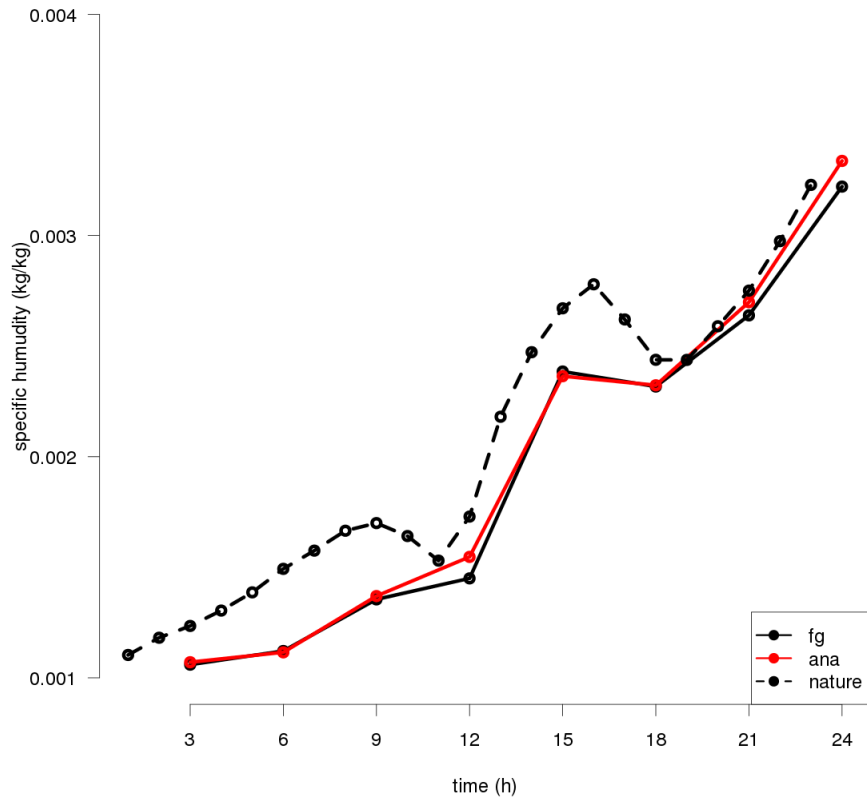


loc100: lh = 100 km

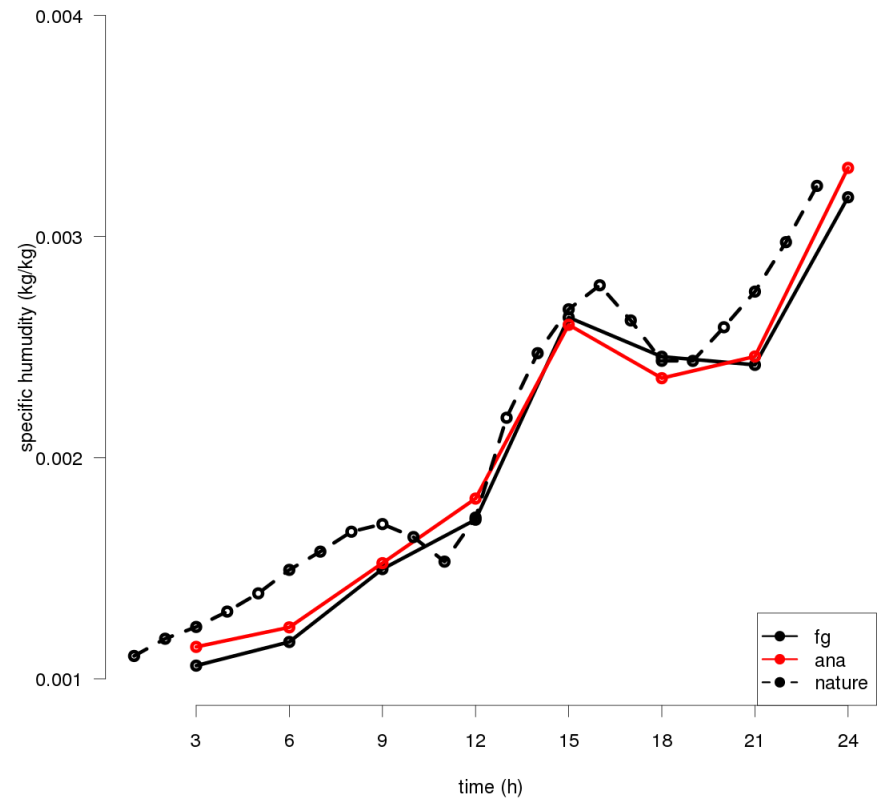
OSSE

sensitivity to localisation

qv level 30 (about 650 hPa) - Liguria-Tuscany area



loc50: Ih = 50 km

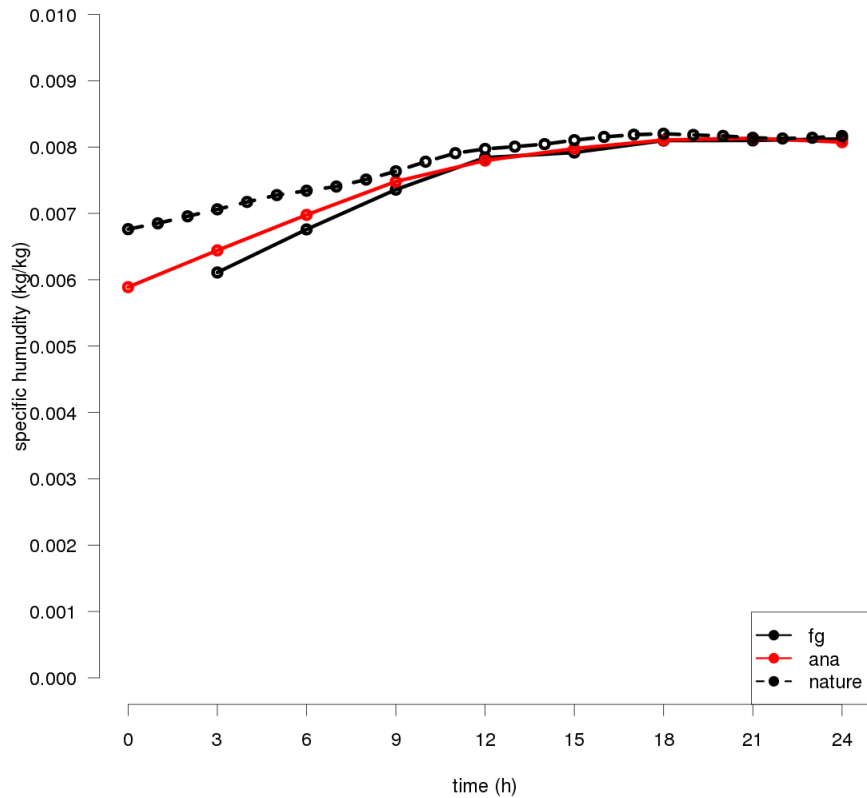


loc100: Ih = 100 km

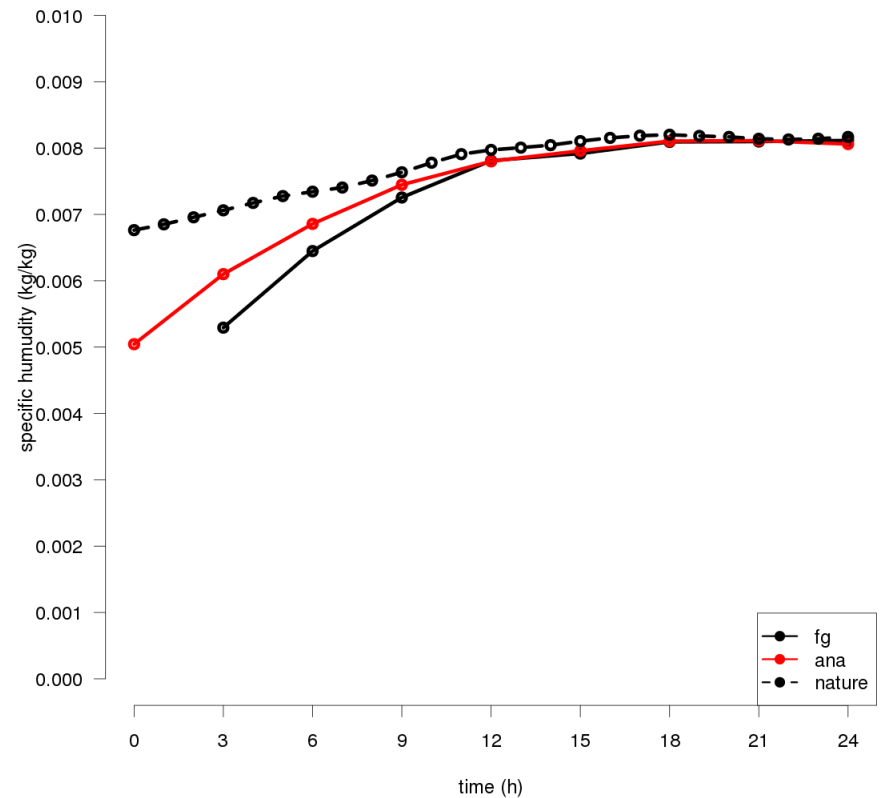
OSSE

sensitivity to spread

qv level 40 (about 900 hPa) - whole domain



loc100 5IC50: 5 members

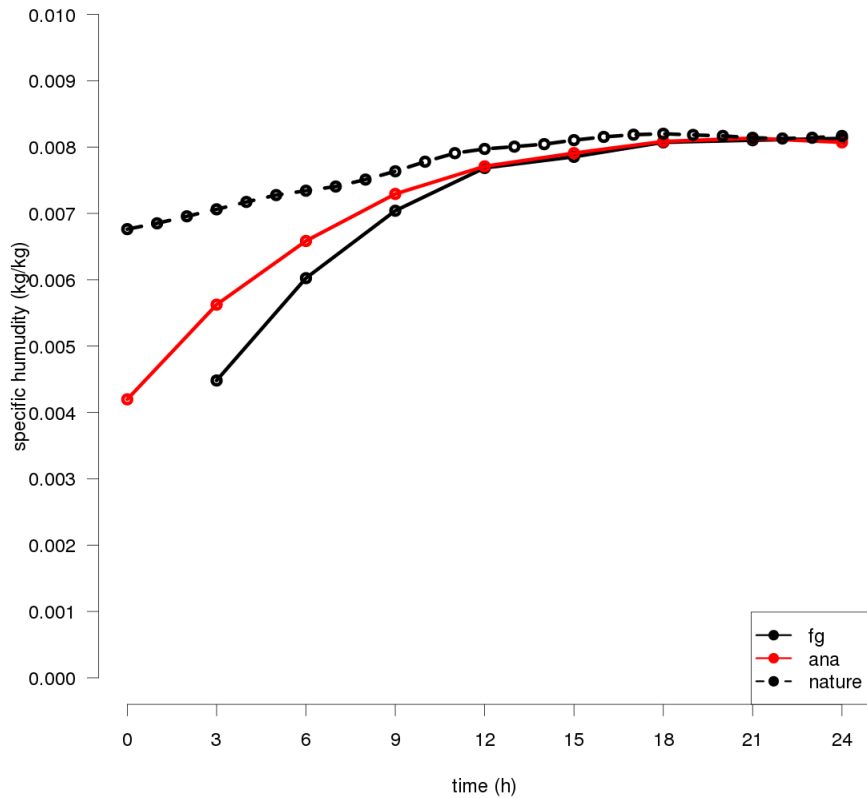


loc100: 10 members

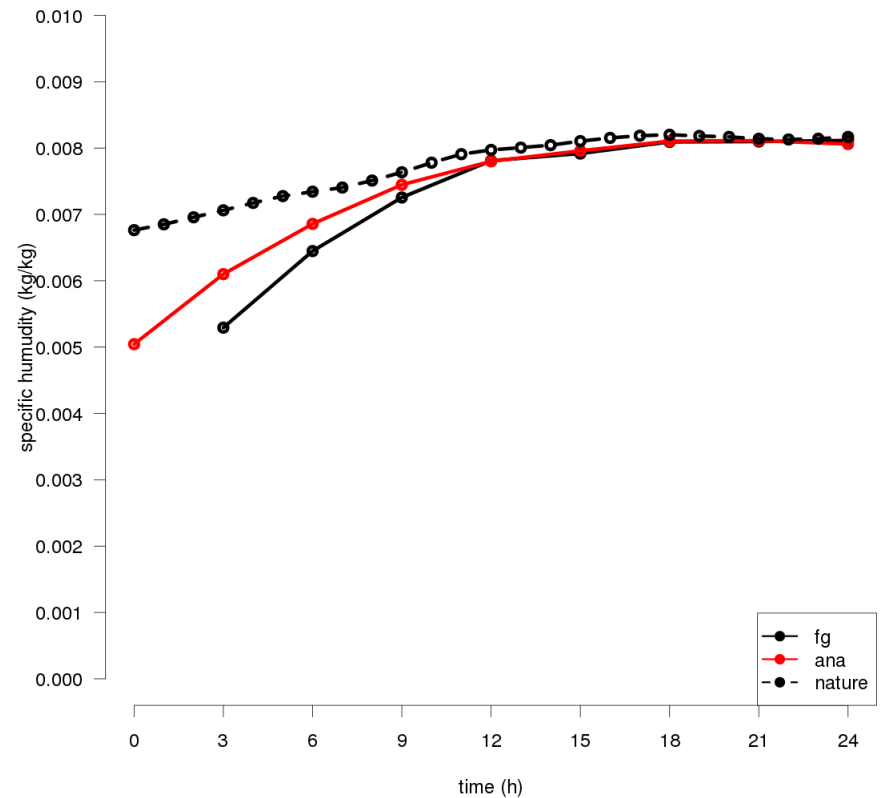
OSSE

sensitivity to spread

qv level 40 (about 900 hPa) - whole domain



loc100 15IC50: 15 members

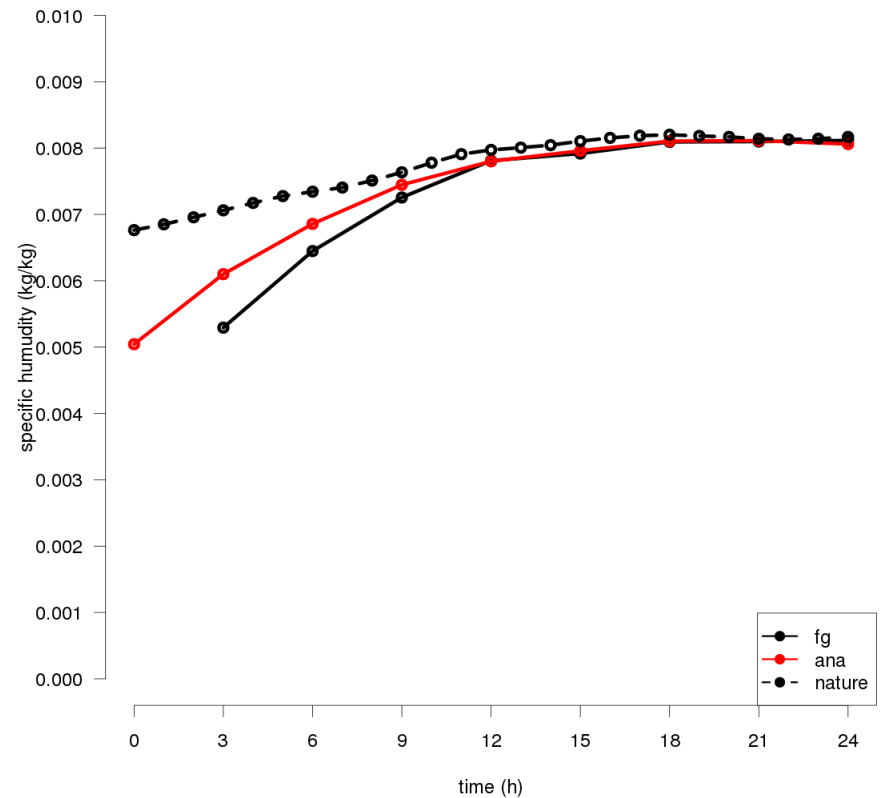
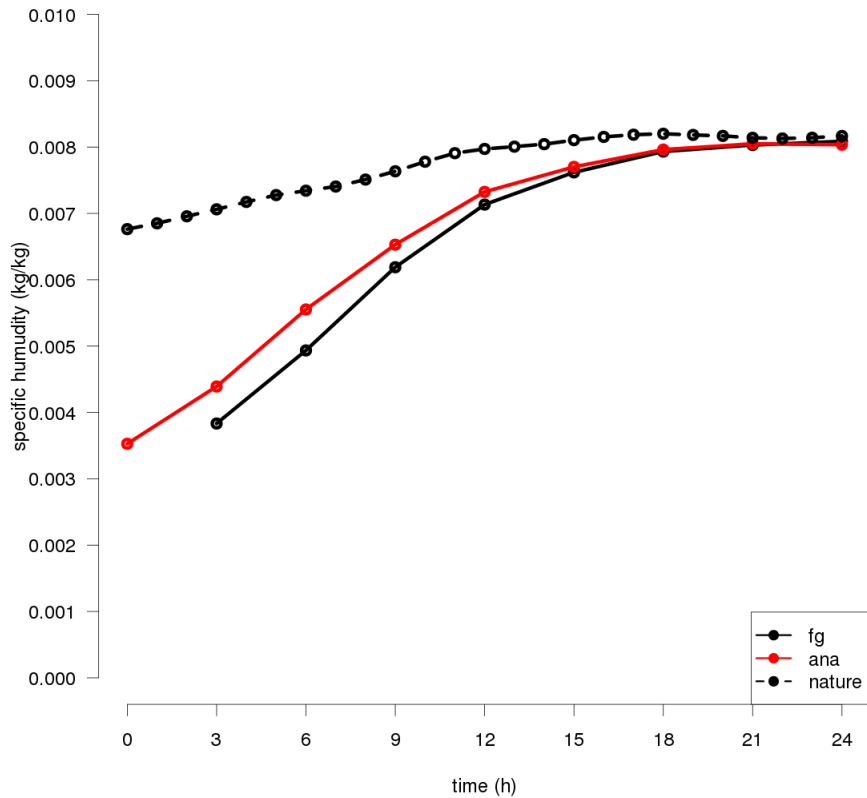


loc100: 10 members

OSSE

sensitivity to spread

qv level 40 (about 900 hPa) - whole domain



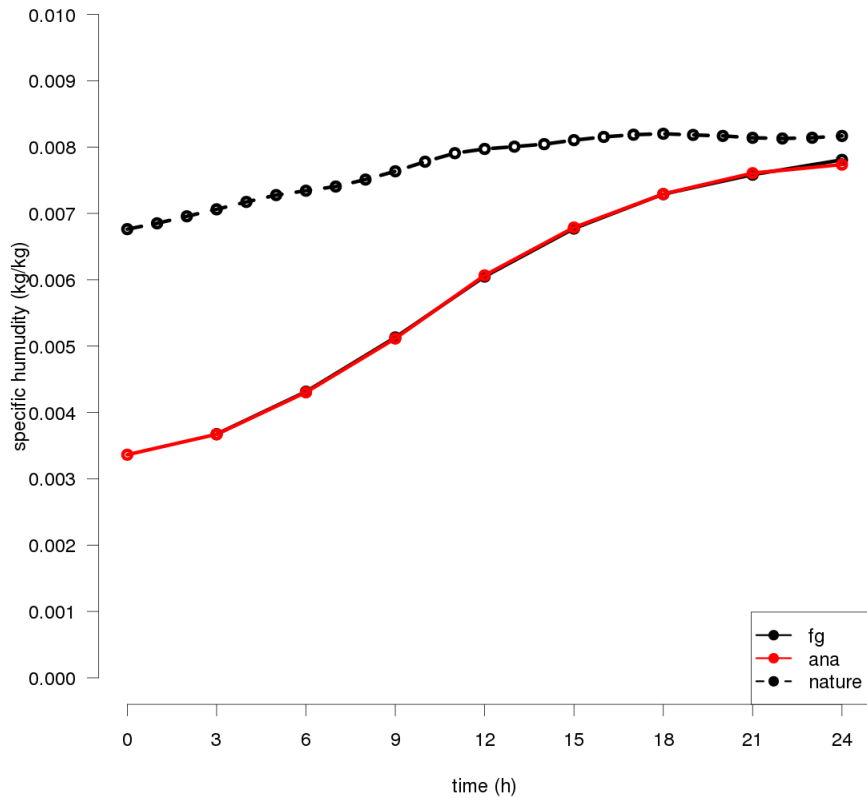
loc100 19IC50: 19 members

loc100: 10 members

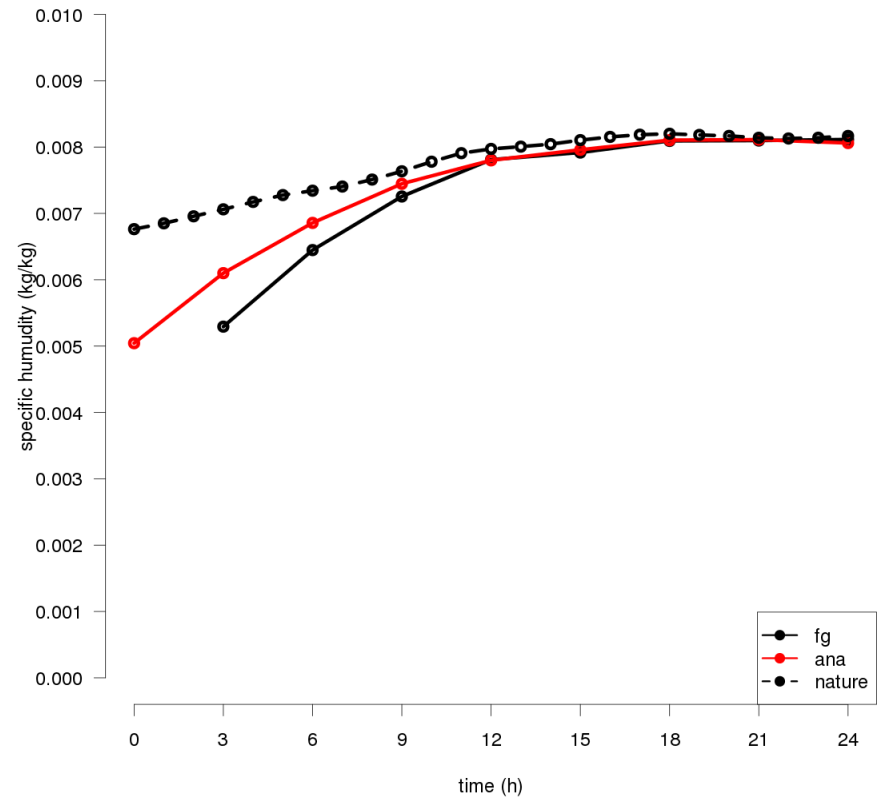
OSSE

sensitivity to spread

qv level 40 (about 900 hPa) - whole domain



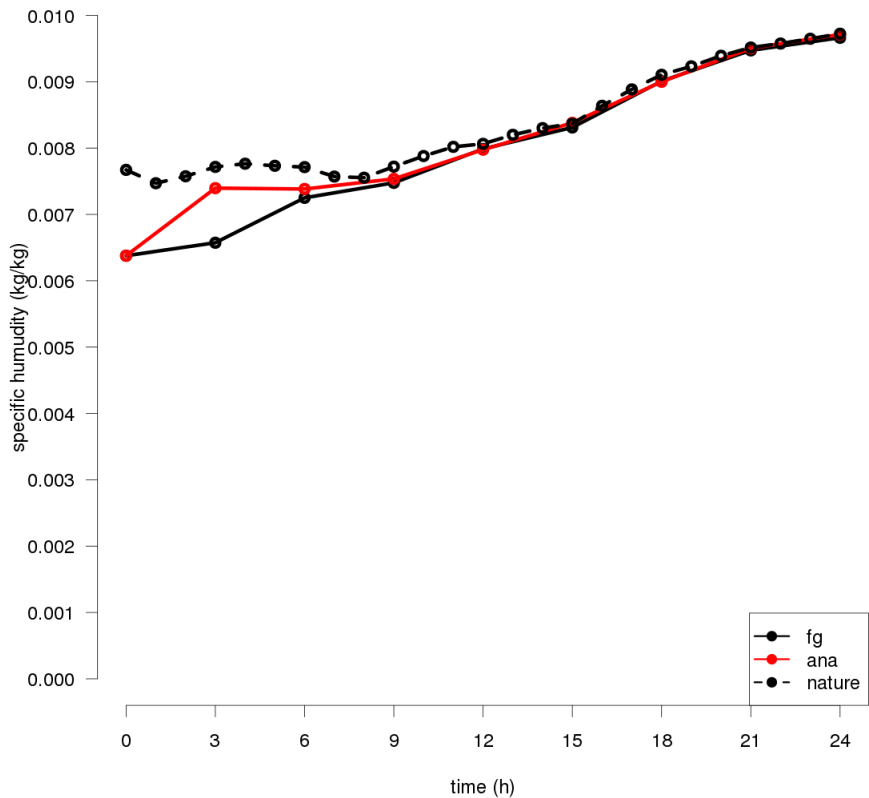
loc100 20IC50: 20 members



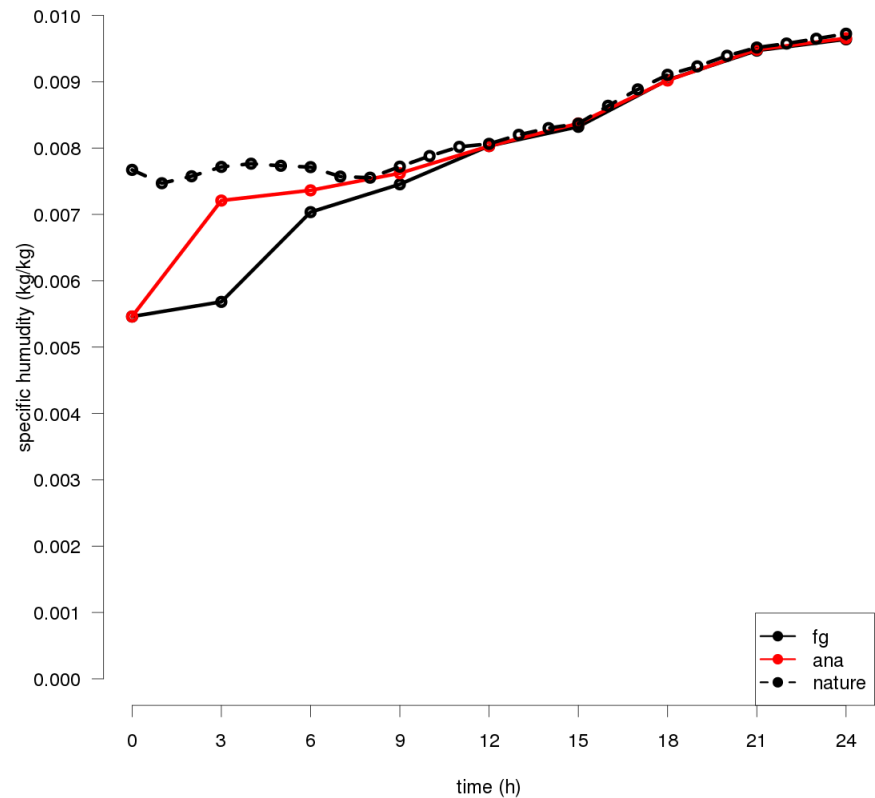
loc100: 10 members

OSSE

sensitivity to spread
qv level 40 (about 900 hPa) – LT area



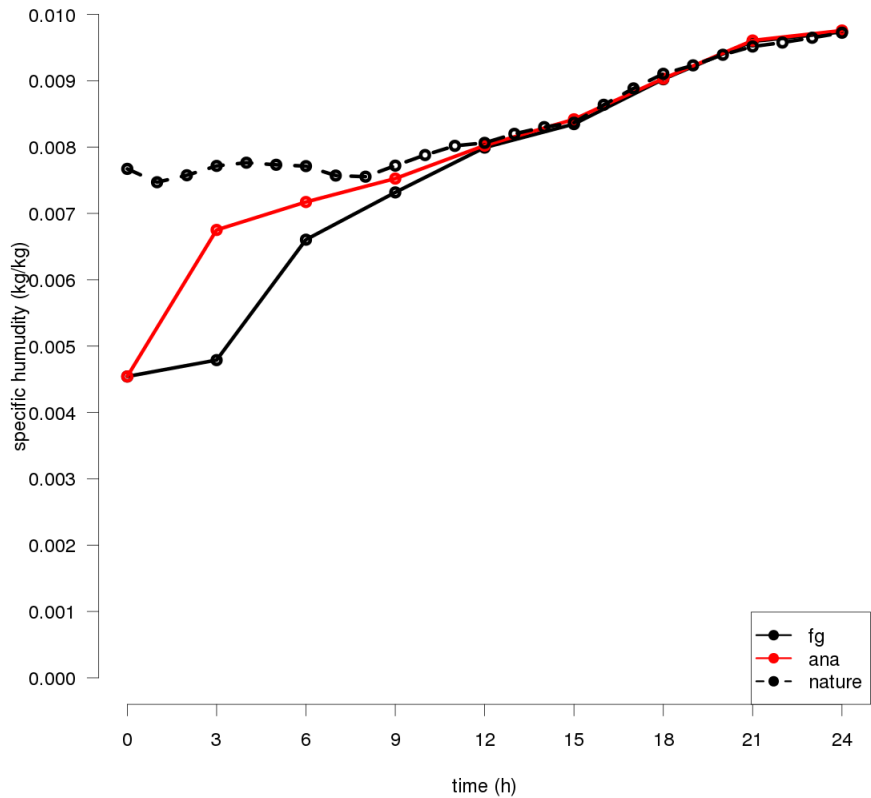
loc100 5IC50: 5 members



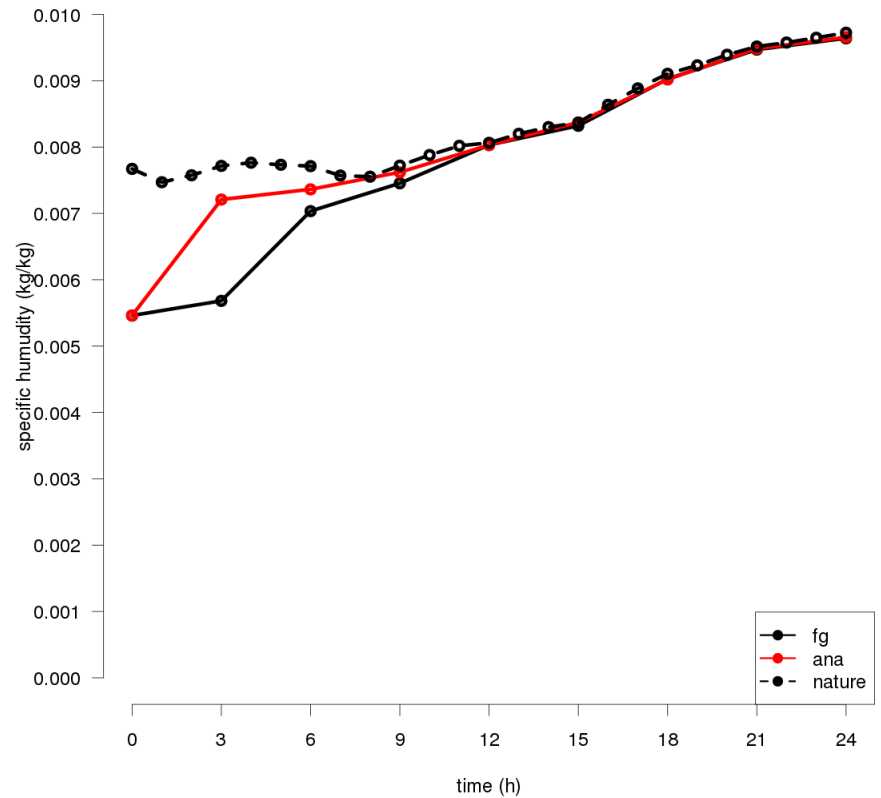
loc100: 10 members

OSSE

sensitivity to spread
qv level 40 (about 900 hPa) – LT area



loc100 15IC50: 15 members

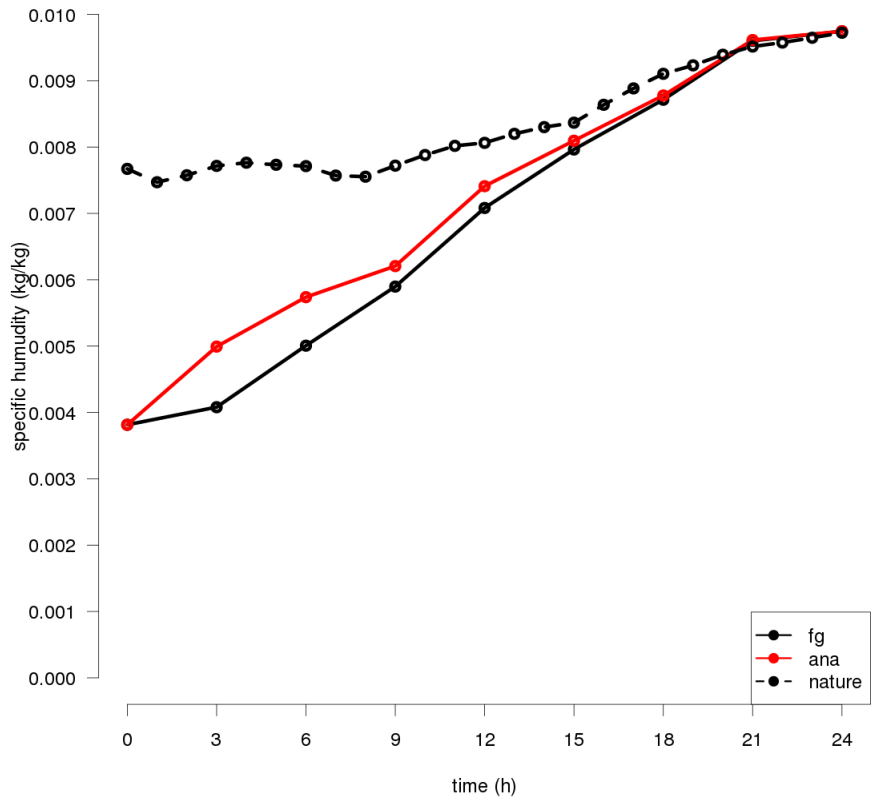


loc100: 10 members

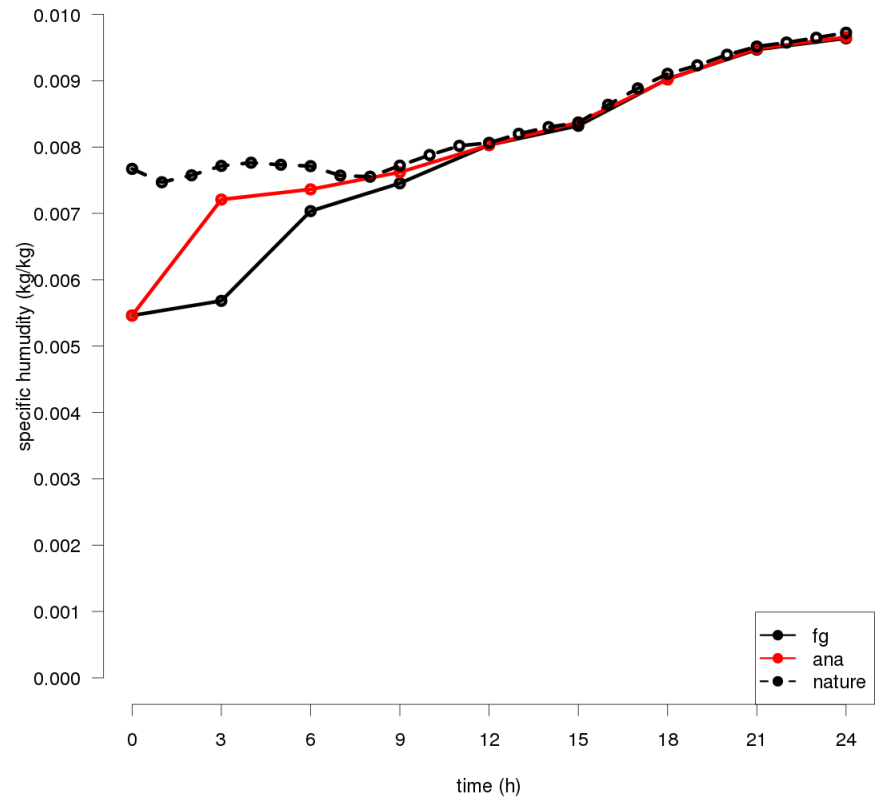
OSSE

sensitivity to spread

qv level 40 (about 900 hPa) – LT area



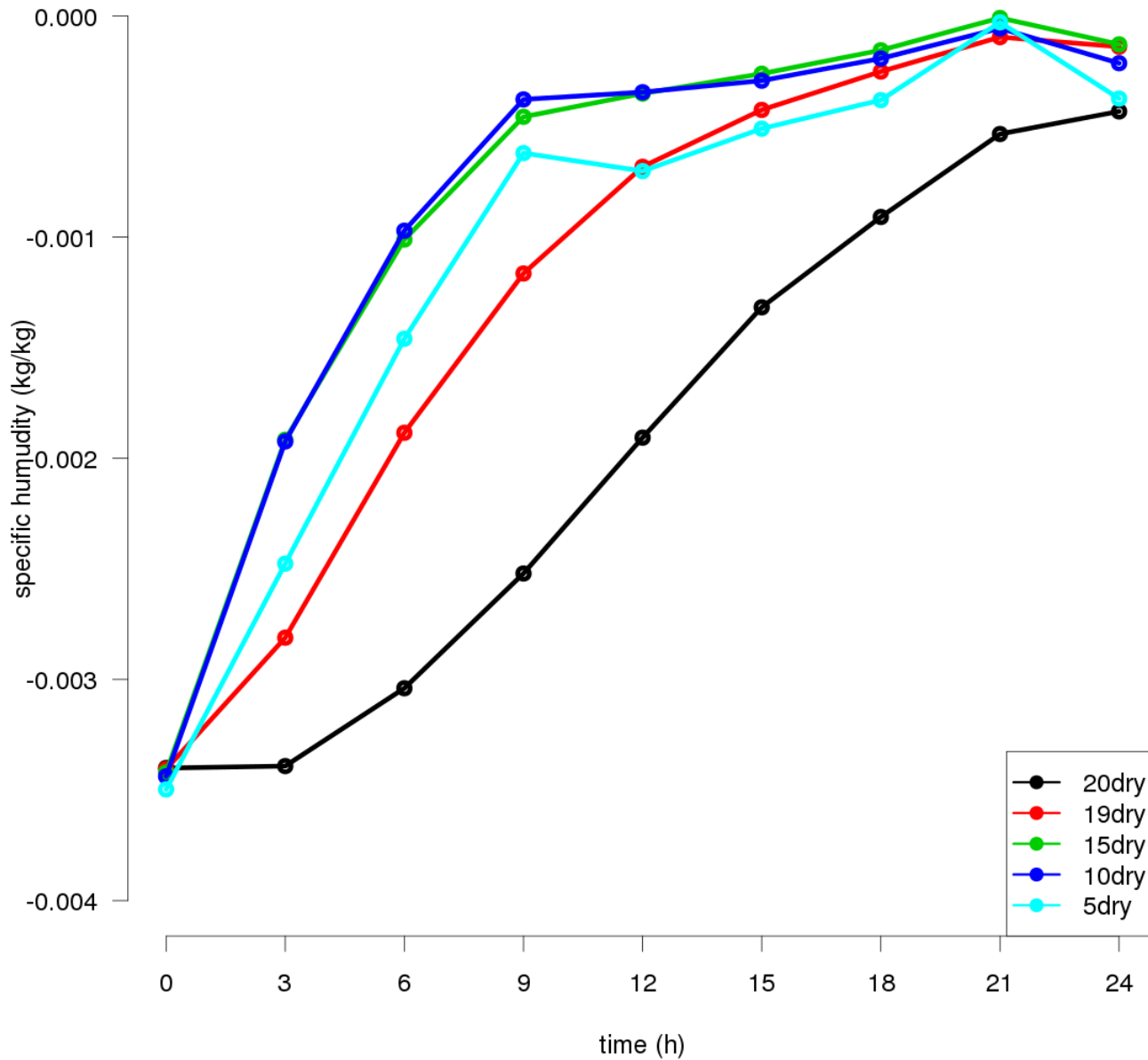
loc100 19IC50: 19 members



loc100: 10 members

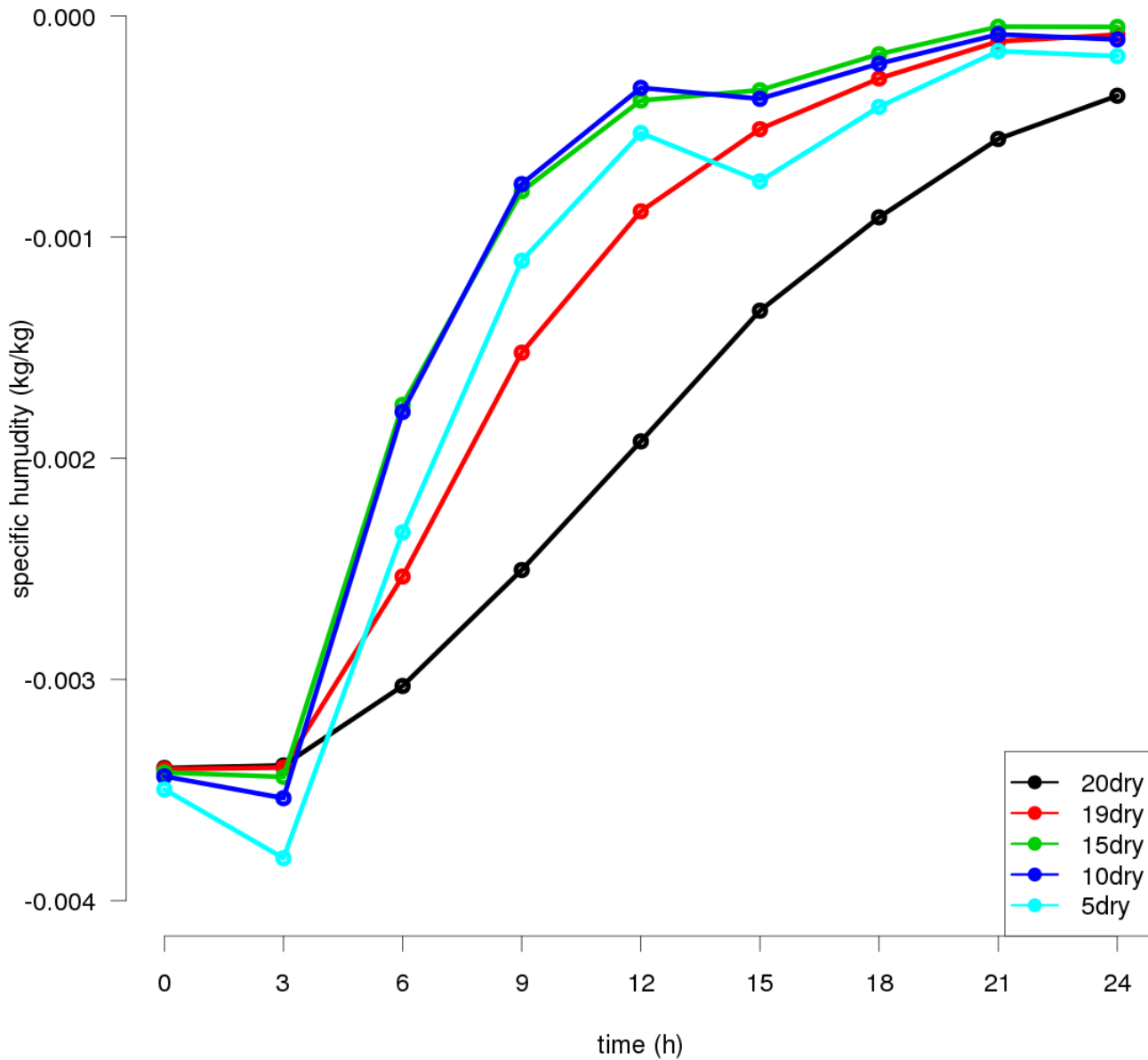
sensitivity to spread – laf (assim)

qv level 40 (about 900 hPa) - whole domain



sensitivity to spread - Iff(bg)

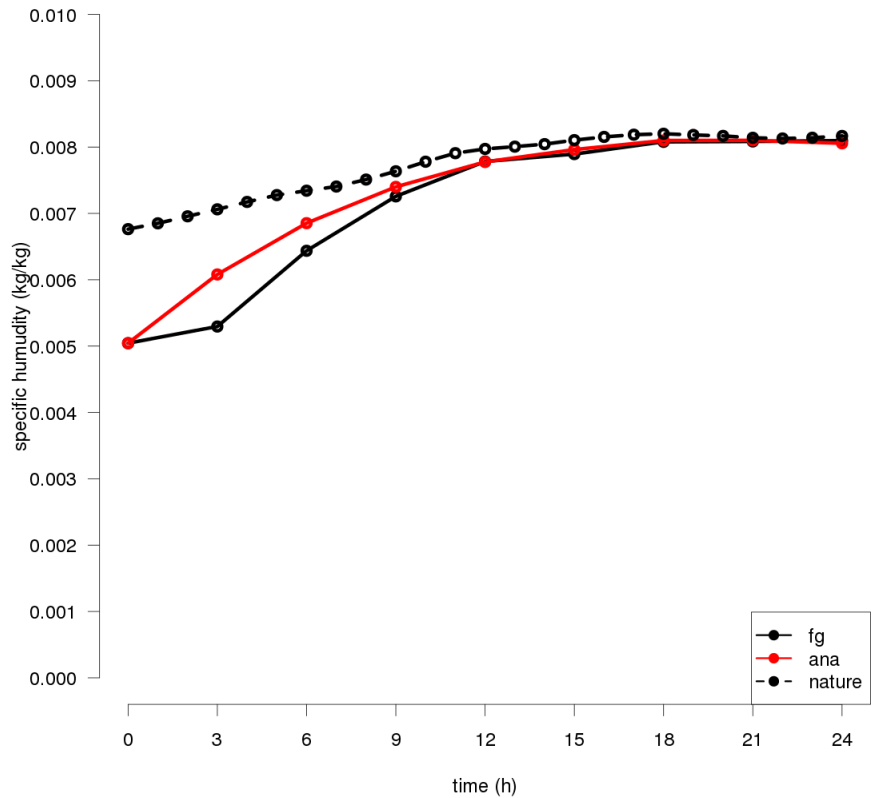
qv level 40 (about 900 hPa) - whole domain



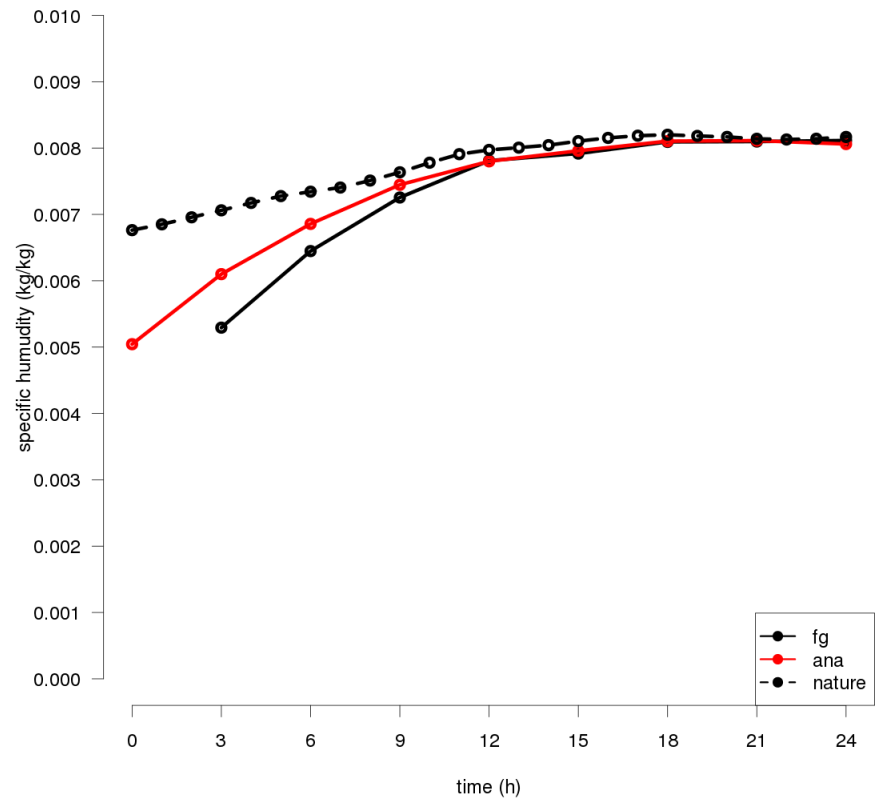
OSSE

sensitivity to number of members

qv level 40 (about 900 hPa) - whole domain



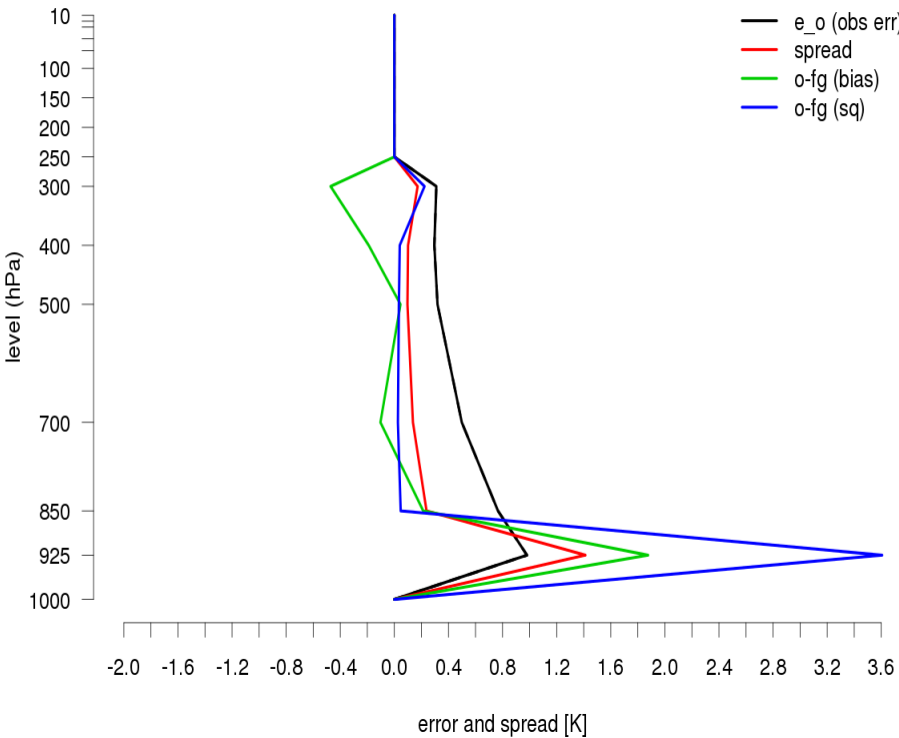
loc100 40 mem: 20 dry



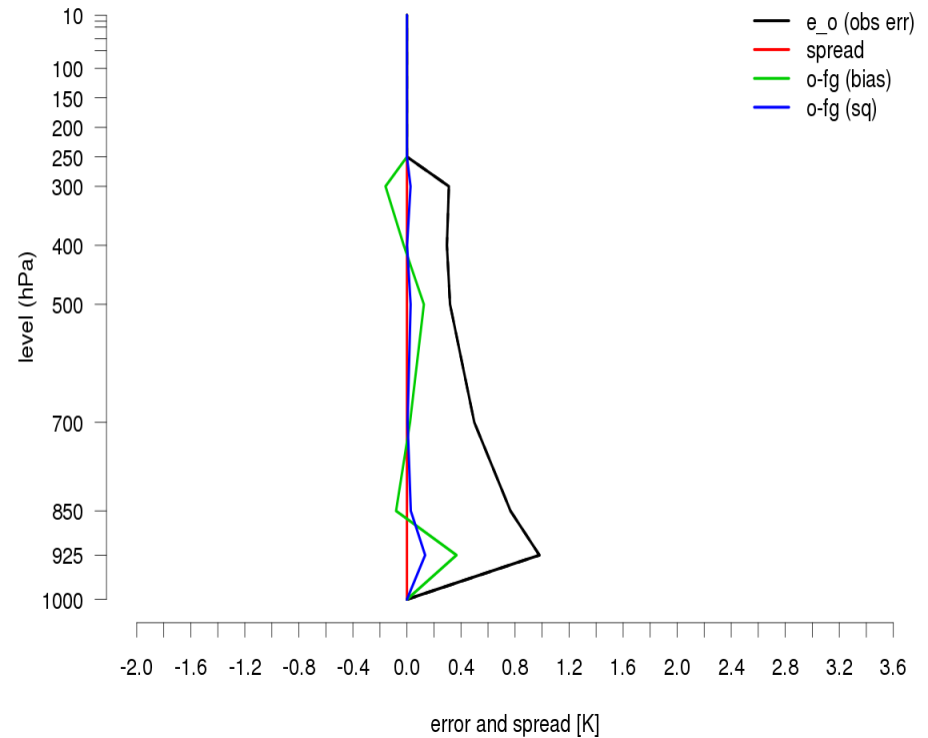
loc100: 10 members

OSSE statistics

1 TEMP observation, first assimilation step



first guess



analysis

Remarks

- at ML40 the assimilation of pseudo-SYNOP is evident
- at ML30 the assimilation is mainly of pseudo-TEMP
- Loc100 is more effective than loc50 (more observation locations, likely SYNOP, are used)
- Lv is not relevant, since mostly the observations are at the ground
- There is a clear difference between having 15 dry members w.r.t. having 19 dry members. In the latter, it is very difficult for the pseudo-obs to increase qv up to the nature run values, while in the first case this happens quite nicely
- This means that if the ensemble is “too wrong” (too much bias and almost no spread) the assimilation cannot work. Otherwise, in 12 h (4 steps) the qv is set back to the nature run values

Future plans

- check the statistics for all the assimilation steps
- introduce more variety between members
- check possibility of using more dense observations
- quality of KENDA analysis for initialising a forecast w.r.t. nudging