

**Performances of the operational RAMS in a  
Mediterranean region as regards to  
quantitative precipitation forecasts.  
Sensitivity of precipitation and wind forecasts  
to the representation of the land cover.**

**M. Pasqui, B. Gozzini, D. Grifoni, F. Meneguzzo,  
G. Messeri, M. Pieri, M. Rossi, G. Zipoli**

**Slide 1**

**22-24 May, 2000**

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**F.M.A.**

Applied Meteorology Foundation

<http://www.lamma.rete.toscana.it>

Model Configuration 

Sensitivity Analysis 

QPF 

Internal Daily Report 

Conclusions 

Slide 2

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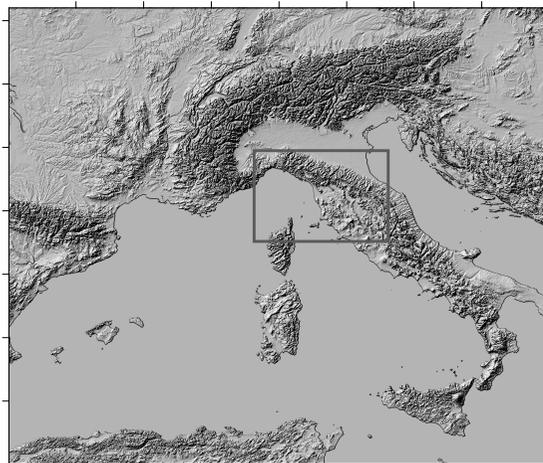
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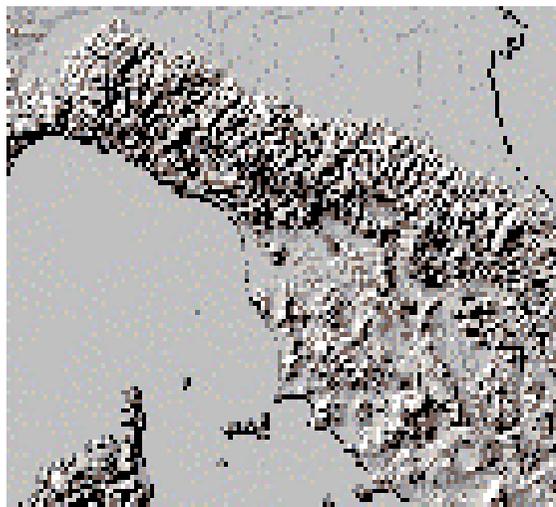
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# Model Configuration

Grid 1



Grid 2



## RAMS 3b

- TWO NESTED GRIDS
- GRID 1: 40x36 points (**40** Km), 24 levels.
- GRID 2: 42x52 points (**8** Km), 24 levels.
- INITIALIZED with ECMWF-GCM (T319) **12:00 UTC** RUN (0.5°x0.5° Resolution)
- FORECAST PERIOD: **72** HOURS
- COMPUTATIONAL TIME: **6** HOURS ON A COMPAQ **XP900-ALPHASTATION**

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Model Configuration 

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QPF 

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# Model Configuration

- Digital Elevation Model: U.S. Geological Survey database 1 Km resolution.
- Land Cover: U.S. Geological Survey database 1 Km resolution.
- Sea Surface Temperature: AVHRR 1 DEG resolution database, updated every week.

... COMING SOON

- Synoptic Surface data and rawinsonde profiles (Mediterranean and European Areas) assimilation (4DDA).
- Sea Surface Temperature: AVHRR 0.01 DEG resolution, updated every day.
- Configuration of RAMS vs. 4.2 / 4.3 on a SGI multiprocessors parallel machine.

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# Sensitivity Study

## Meteorological Events

- Stratification (7-8 December 1998)
- Synoptic Forcing (6-7 November 1999)
- Sea-Land Breeze Circulation (28-29 June 1998)
- Intense Precipitation Event (20-21 September 1999)

Model Configuration

Sensitivity Analysis

QPF

Internal Daily Report

Conclusions

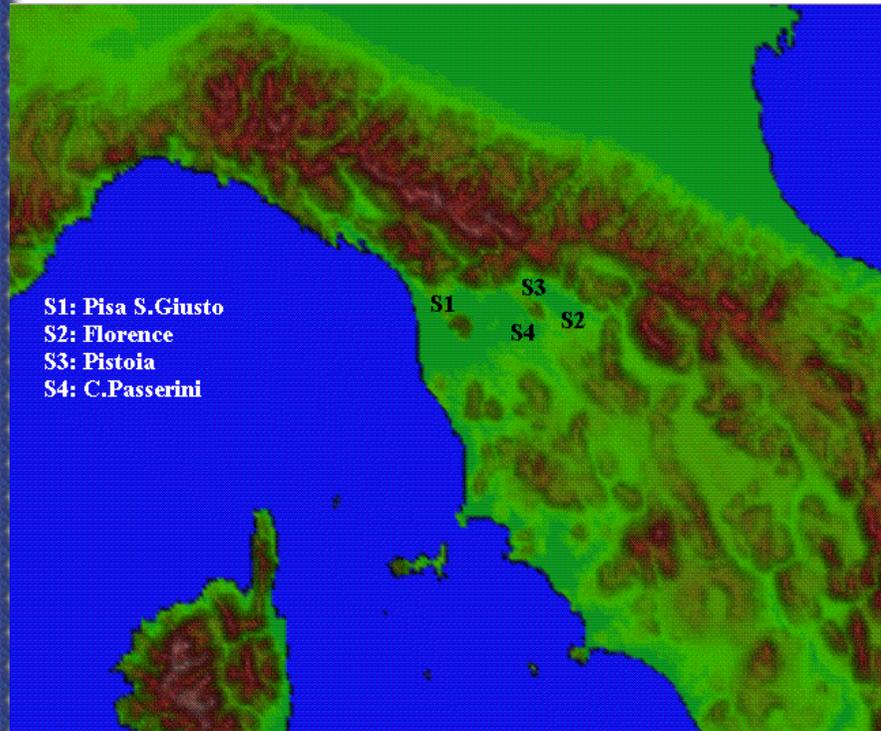
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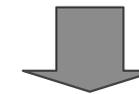
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## Operational Model Configuration

- USGS -Data Base (1 Km)  
Topography and Land Use
- ECMWF Model Run (12:00 UTC)  
+ 36 hours
- NOAA Sea Surface Temperature



## Simulations Configuration

- **Heterogeneous L.C.:**  
Block Majority Method
- **Homogeneous L.C.:**  
Constant L.C. (Crop Mixed Farming)

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# Stratification

7- 8 December 1998

Model Configuration

Sensitivity Analysis

QPF

Internal Daily Report

Conclusions

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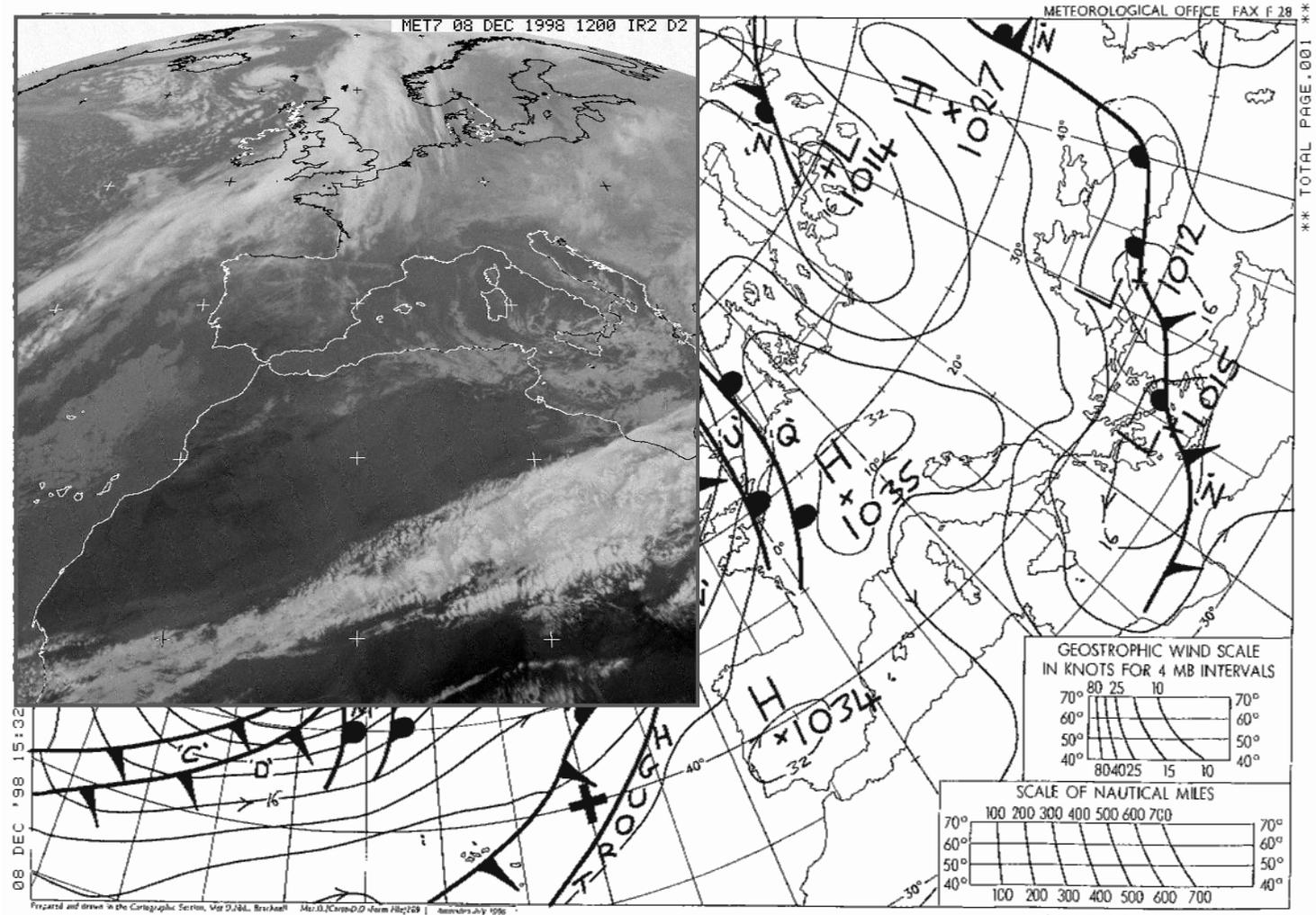
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Comes to you via Top Karten (<http://www-imk.physik.uni-karlsruhe.de/~gmueeller/metbest.html>)  
Source (TIFF-Files): <ftp://weather.noaa.gov>



<http://www.lamma.rete.toscana.it>

# Stratification

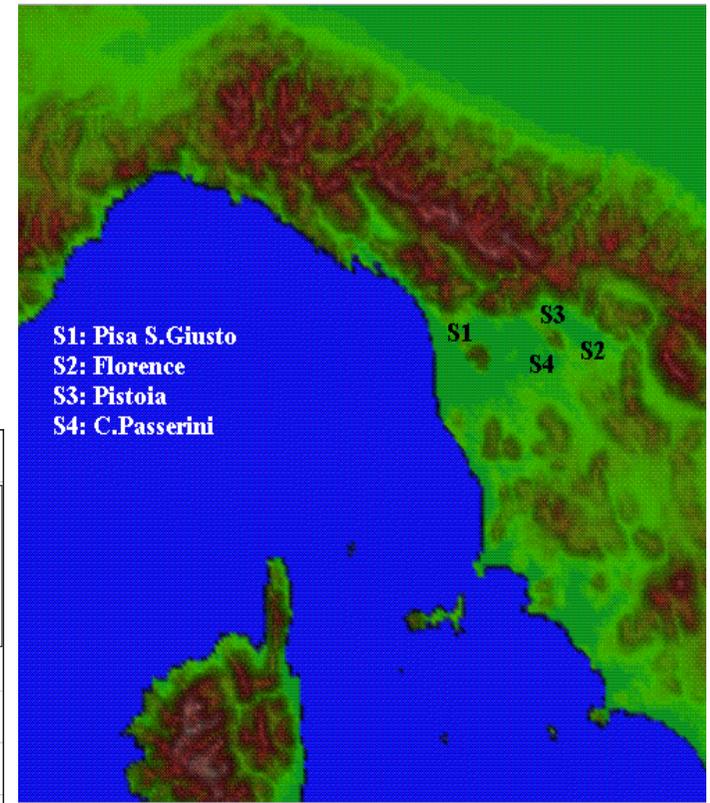
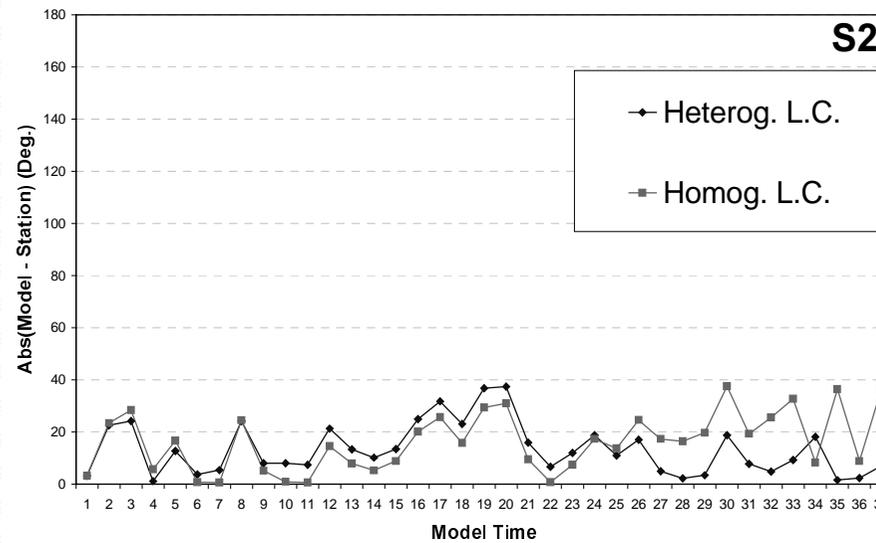
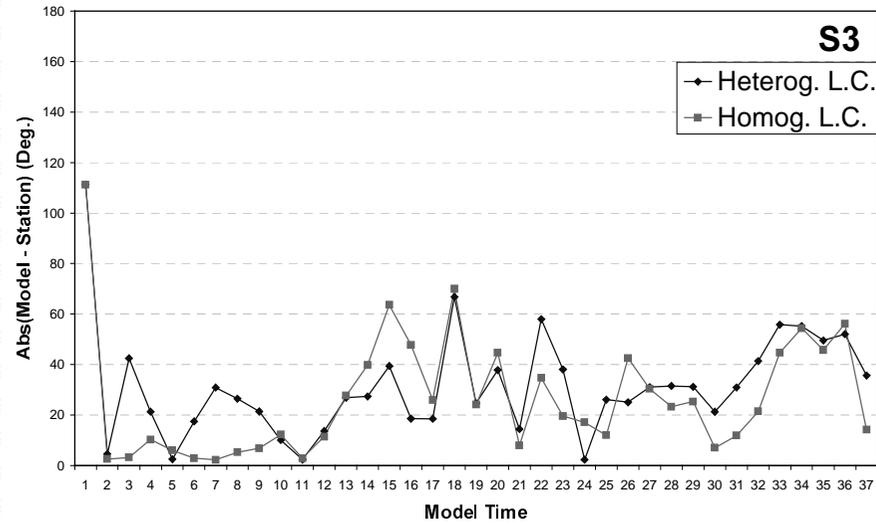
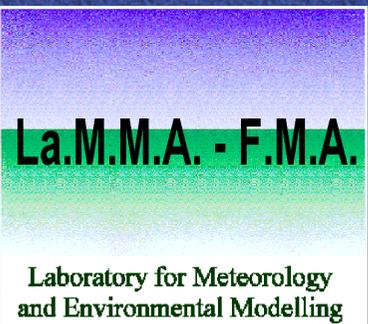
7- 8 December 1998

- Model Configuration
- Sensitivity Analysis
- QPF
- Internal Daily Report
- Conclusions

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# Synoptic Forcing

6- 7 November 1999

Model Configuration

Sensitivity Analysis

QPF

Internal Daily Report

Conclusions

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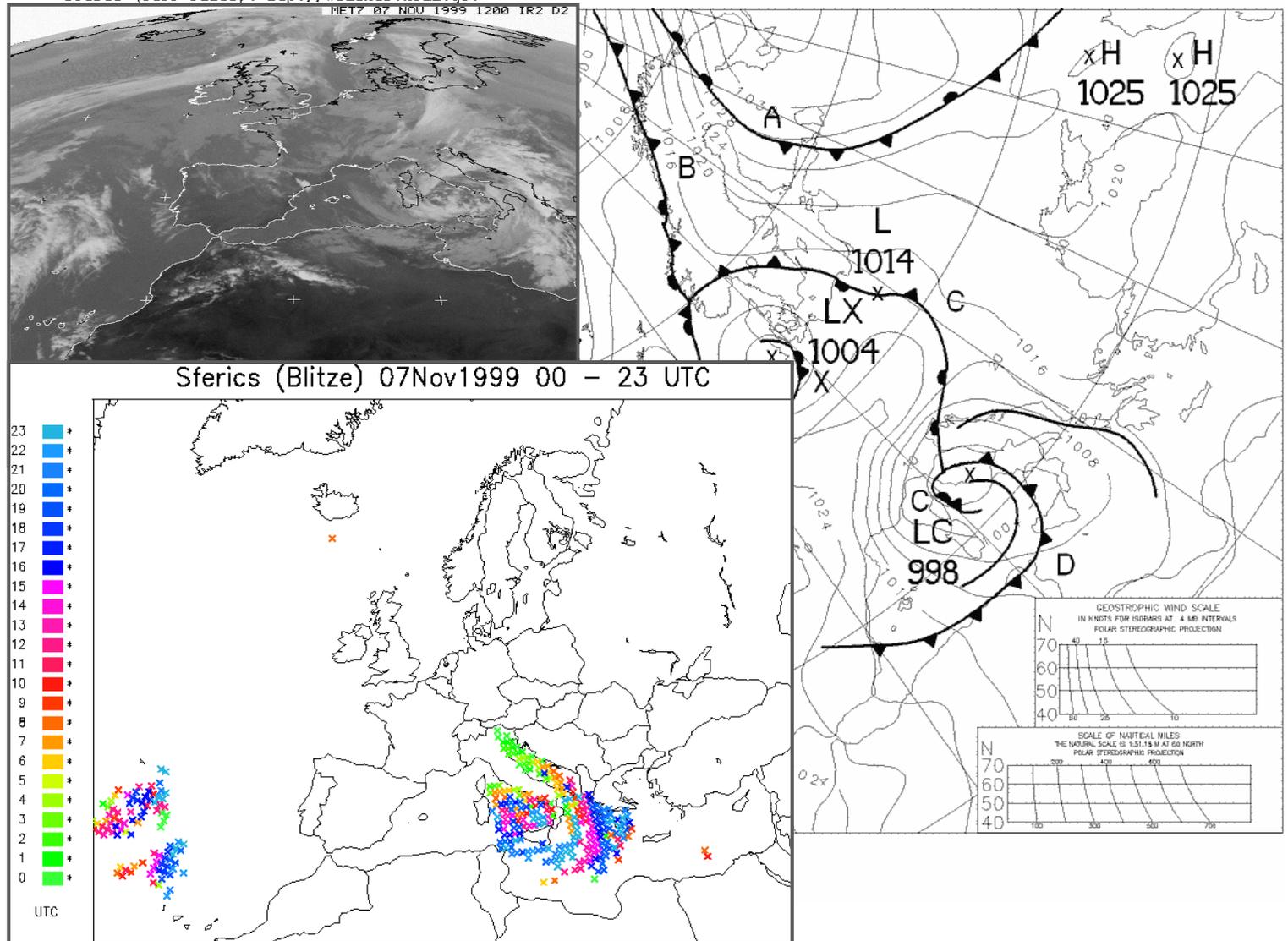
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Comes to you via Top Karten (<http://www.wetterzentrale.de/topkarten/>)  
Source (TIFF-Files): <ftp://weather.noaa.gov>



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# Synoptic Forcing

6- 7 November 1999

- Model Configuration
- Sensitivity Analysis
- QPF
- Internal Daily Report
- Conclusions

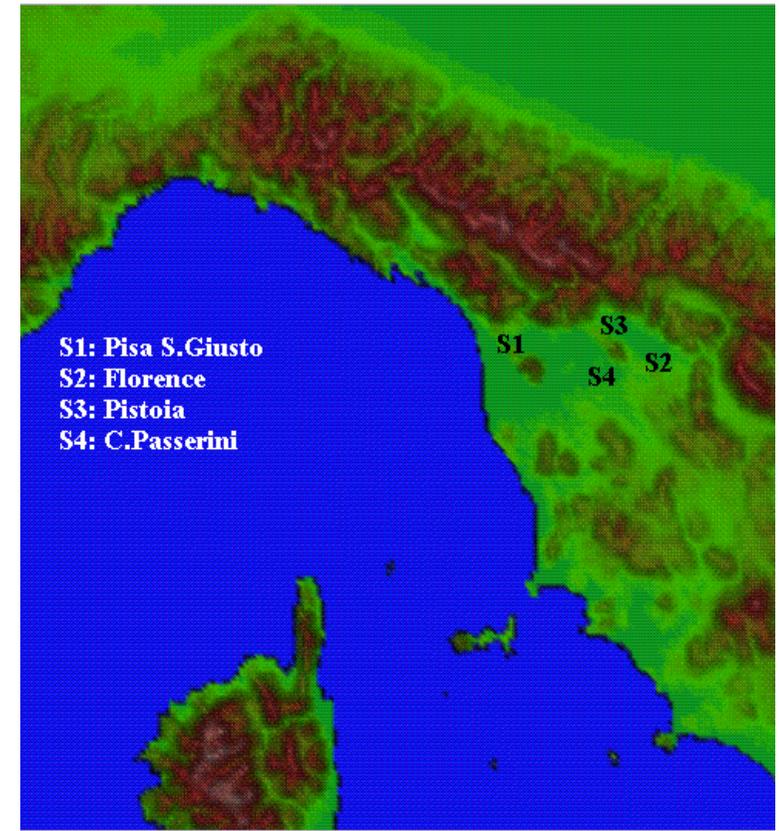
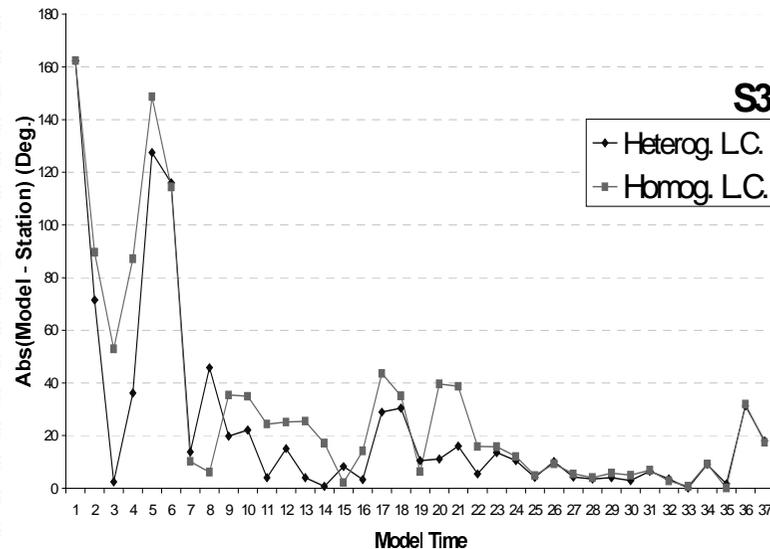
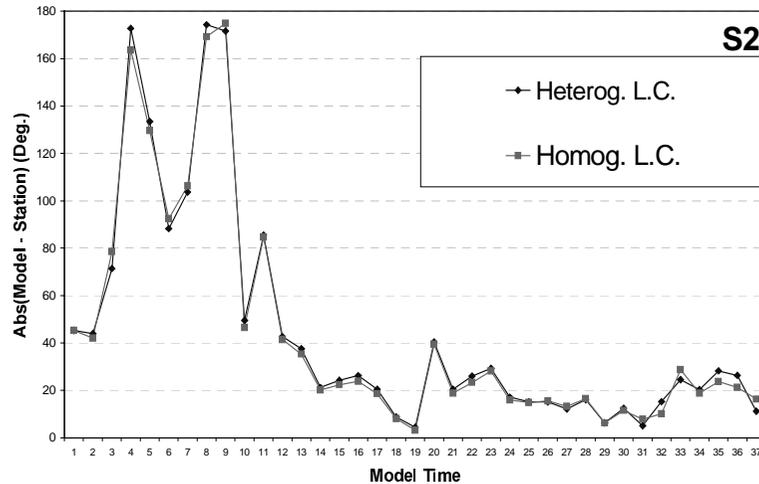
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# Sea-Land Breeze Circulation

26-27 June 1998

- Model Configuration
- Sensitivity Analysis
- QPF
- Internal Daily Report
- Conclusions

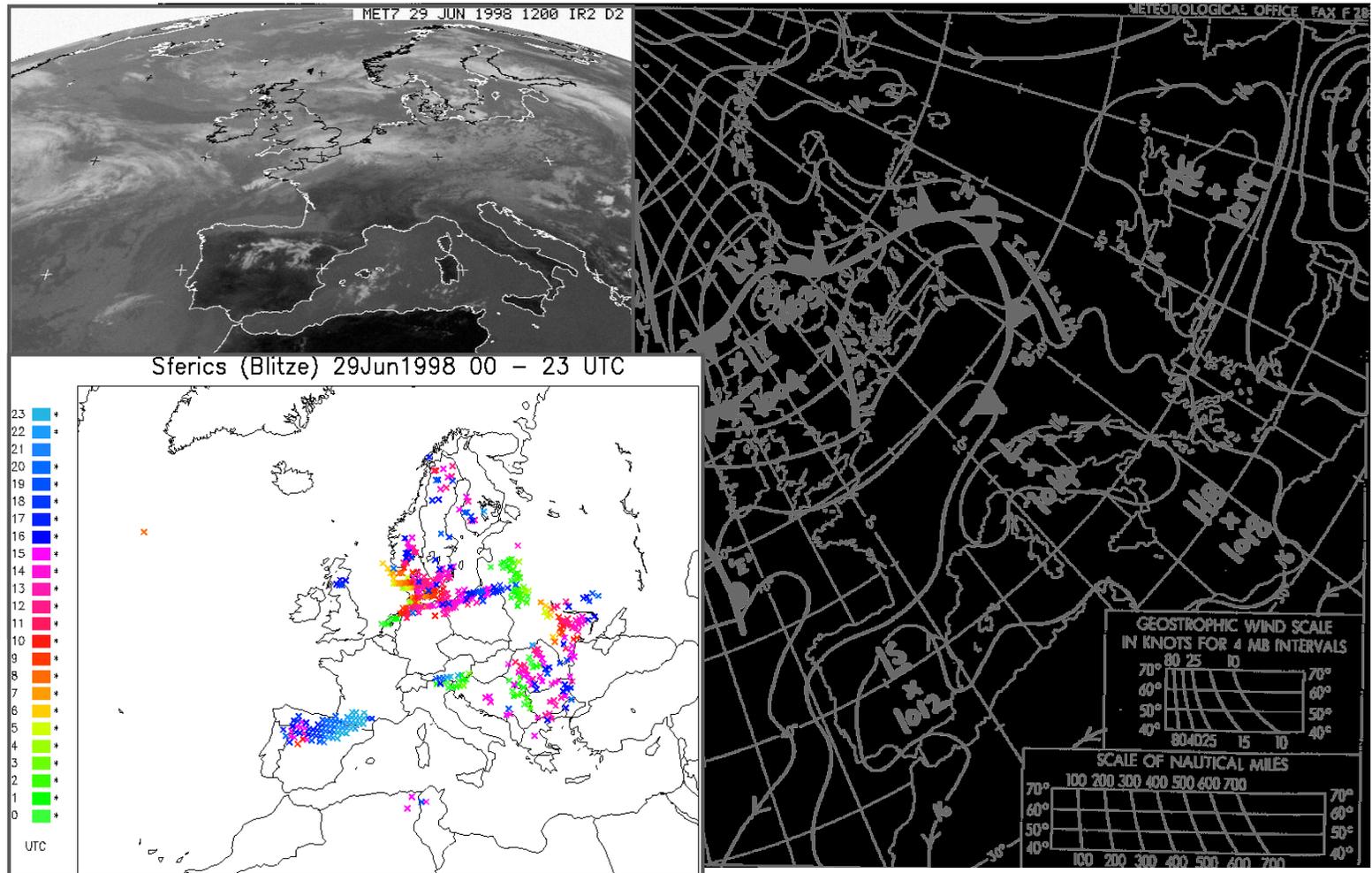
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# Sea-Land Breeze Circulation

26-27 June 1998

- Model Configuration
- Sensitivity Analysis
- QPF
- Internal Daily Report
- Conclusions

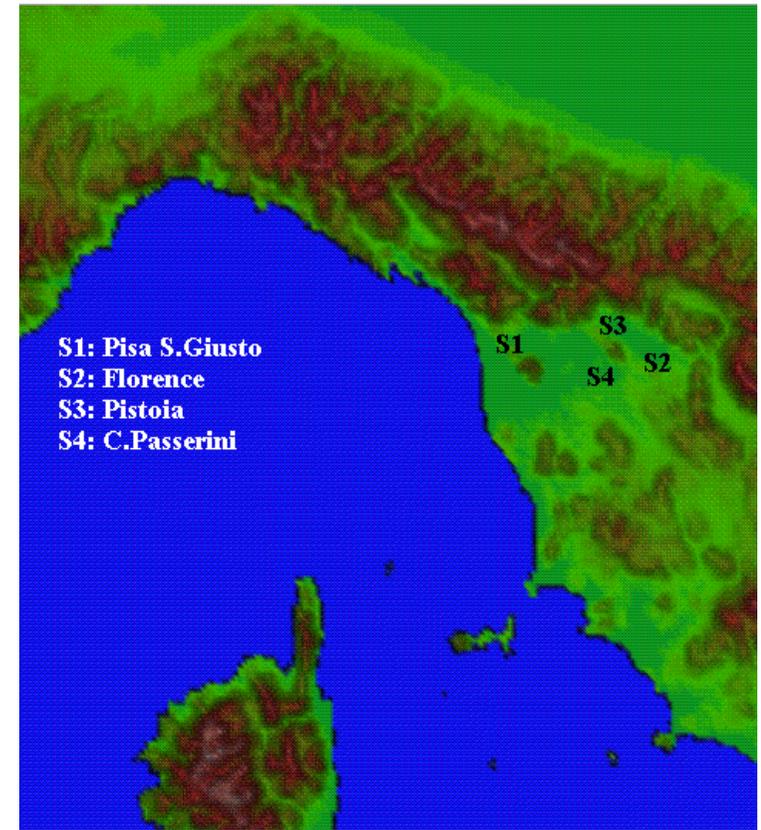
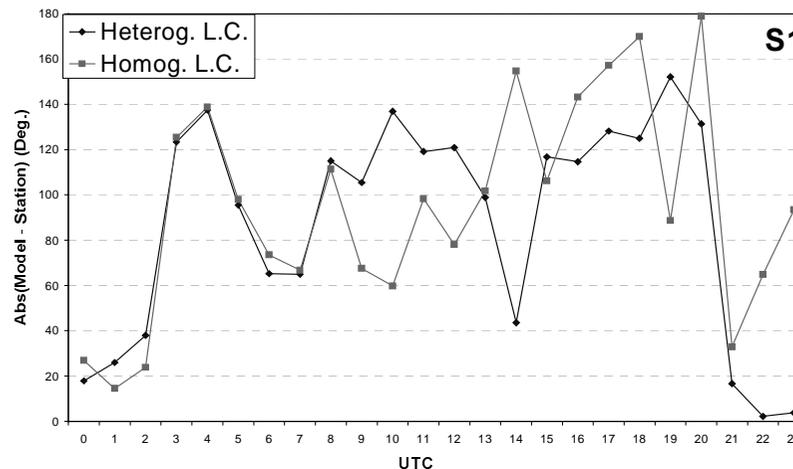
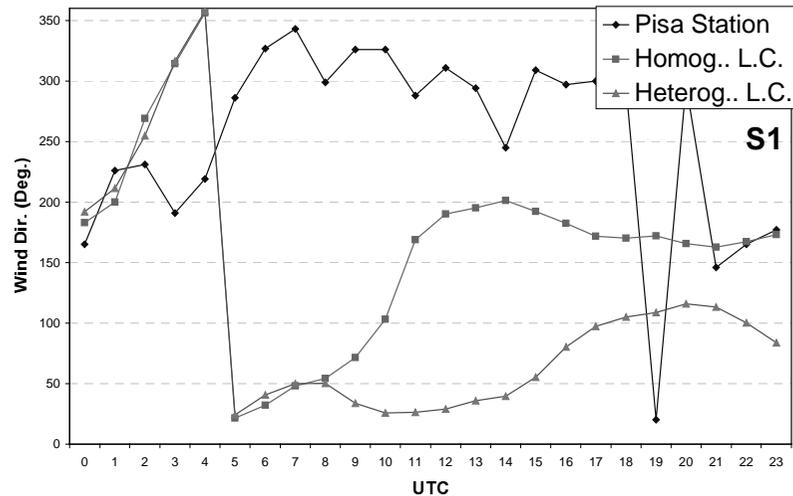
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# Sea-Land Breeze Circulation

26-27 June 1998

- Model Configuration
- Sensitivity Analysis
- QPF
- Internal Daily Report
- Conclusions

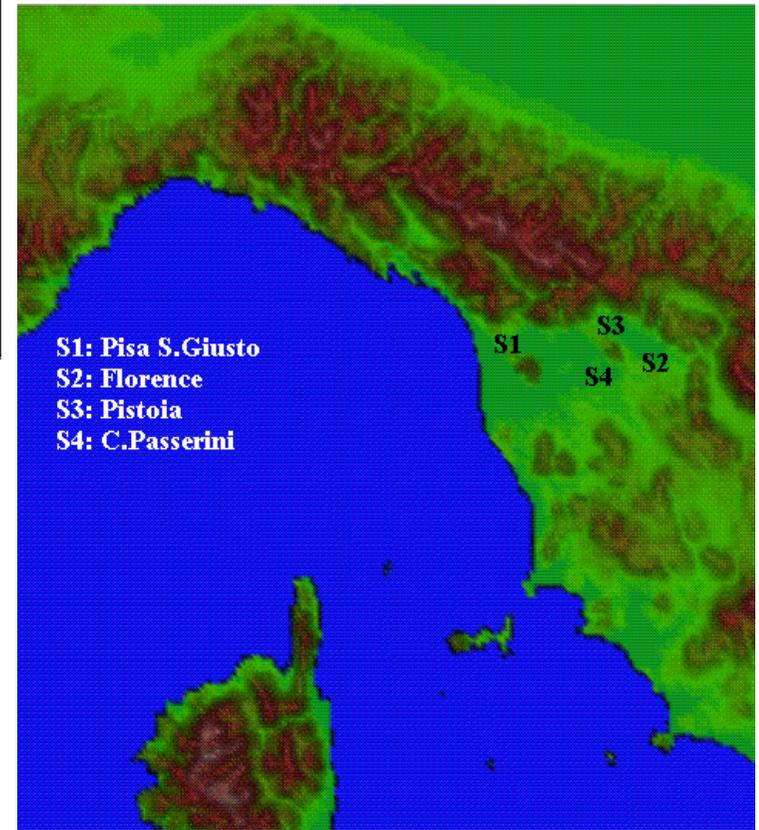
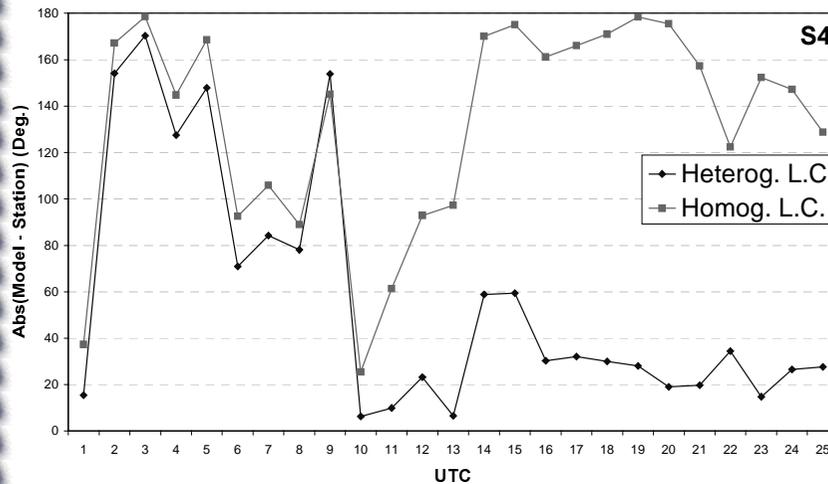
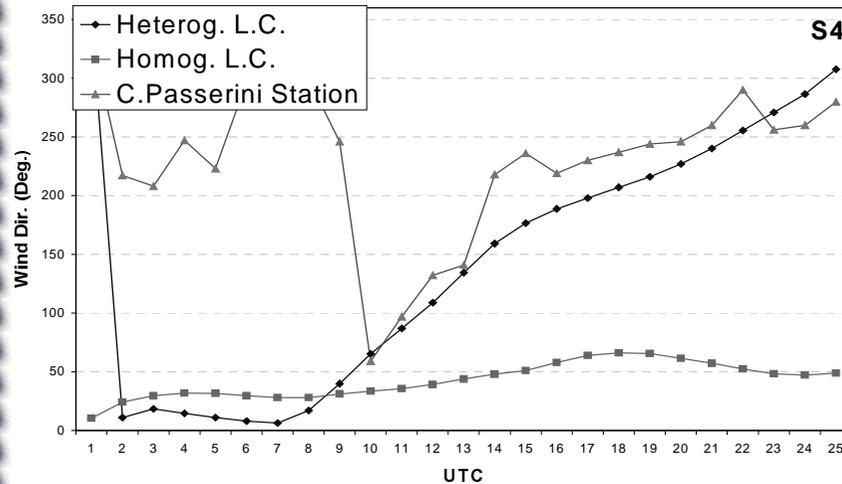
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# Intense Precipitation Event

## 20-21 September 1999

Model Configuration

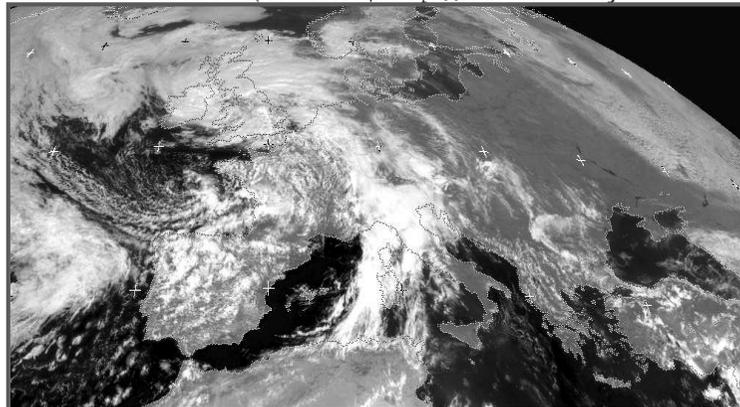
Sensitivity Analysis

QPF

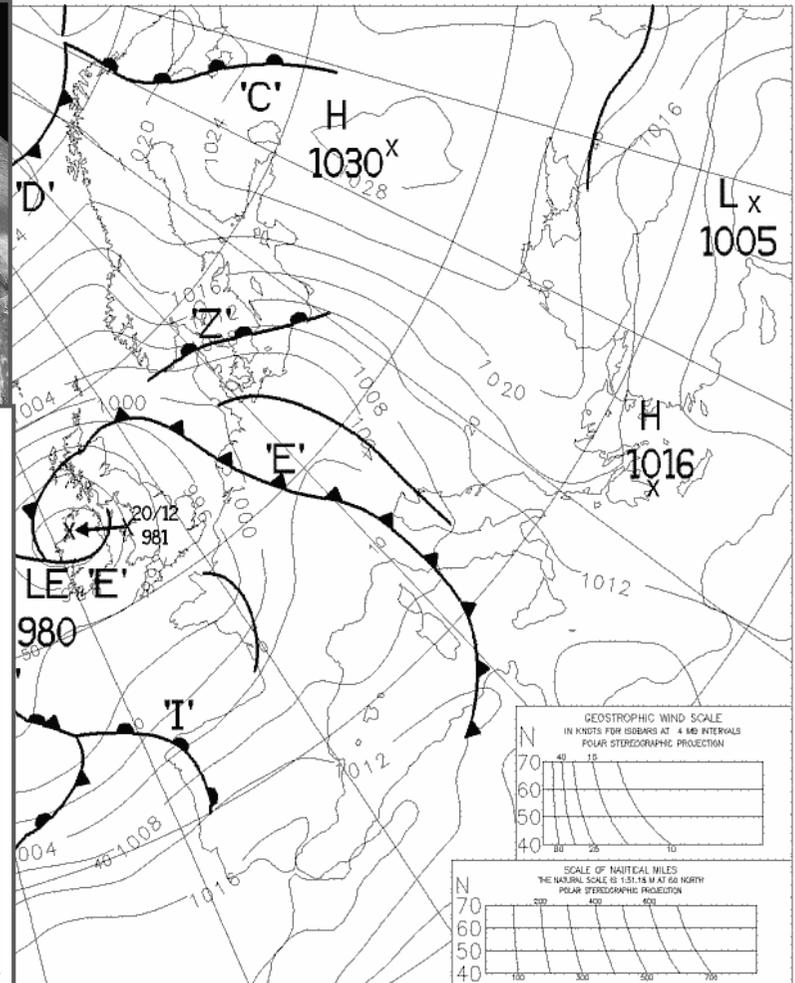
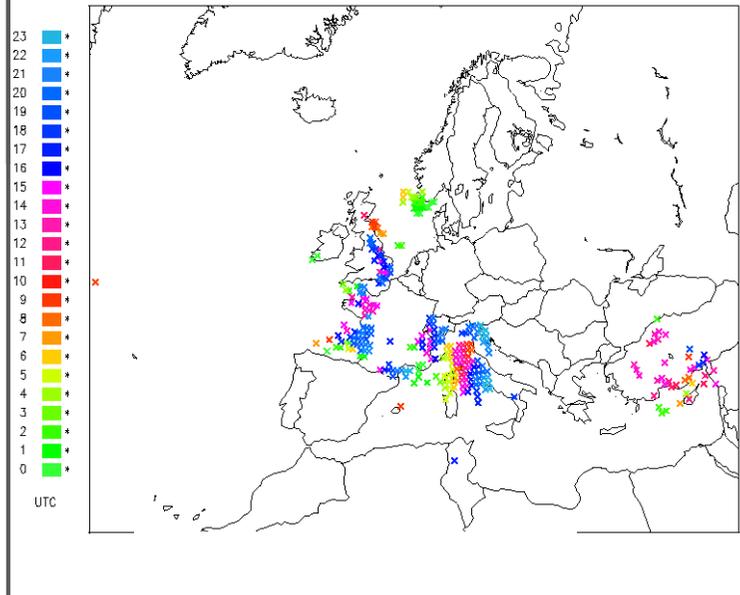
Internal Daily Report

Conclusions

Comes to you via Top Karten (<http://www.wetterzentrale.de/topkarten/>)  
Source (TIFF-Files): <ftp://weather.noaa.gov>



Sferics (Blitze) 20Sep1999 00 - 23 UTC



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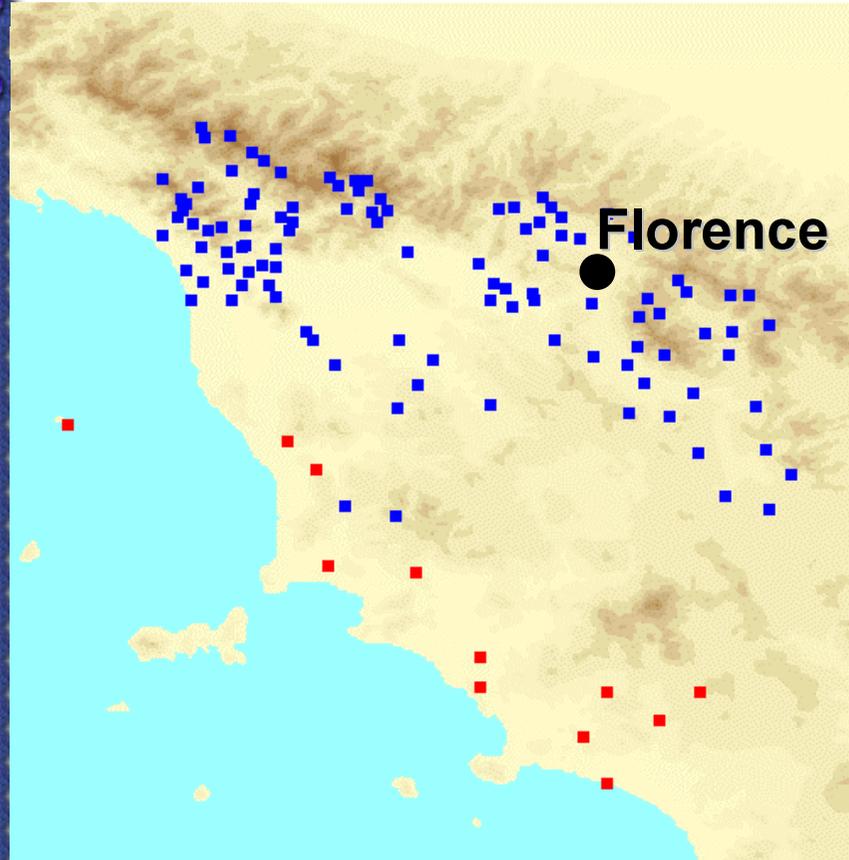
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# Stations Comparison

20-21 September 1999

Model Configuration   
Sensitivity Analysis   
QPF   
Internal Daily Report   
Conclusions 



## Rain Gauges Networks

- Hydrological National Service
- ARSIA (Tuscany Region)

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# Cumulated Precipitation 00:00 - 11:00 (UTC)

Model Configuration

Sensitivity Analysis

QPF

Internal Daily Report

Conclusions

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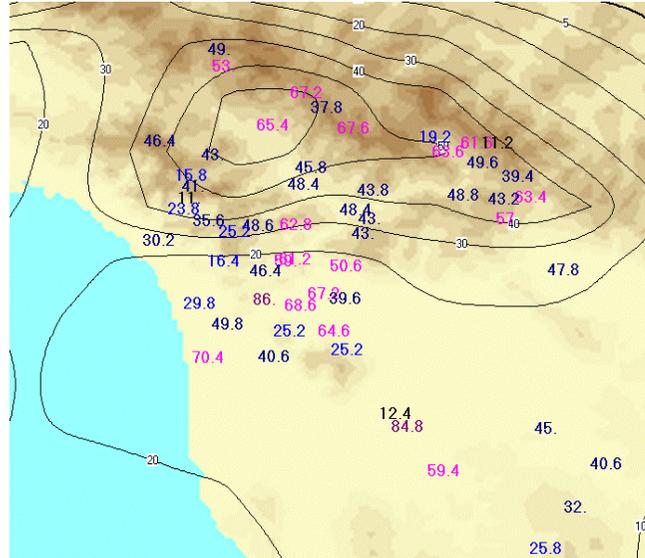
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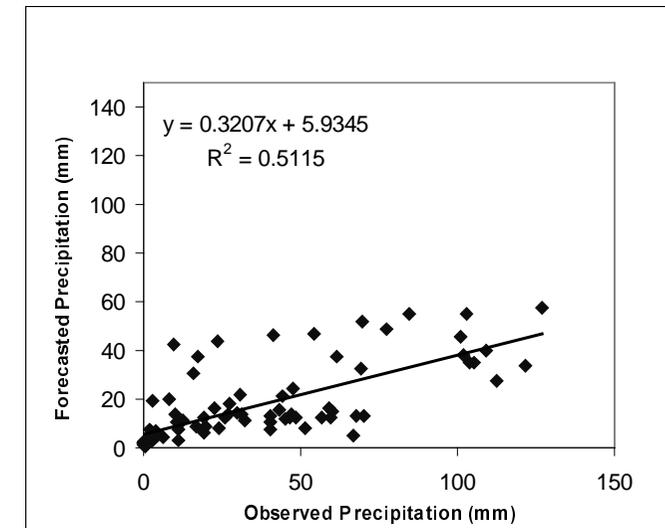
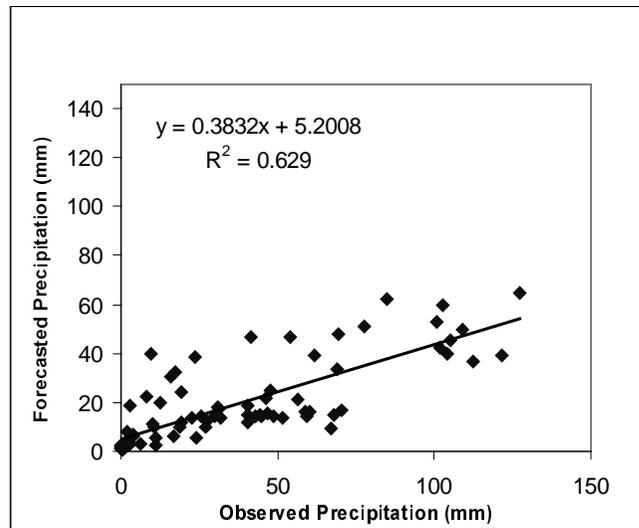
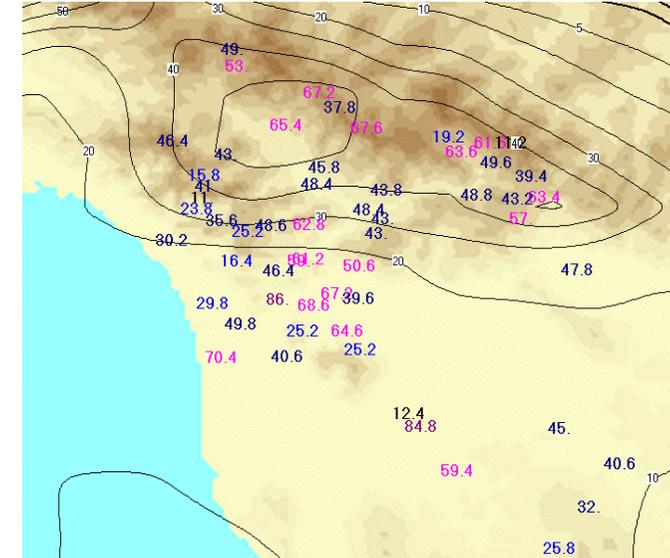
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Heterog. L. C.



Homog. L. C.



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- Model Configuration 
- Sensitivity Analysis 
- QPF 
- Internal Daily Report 
- Conclusions 

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# Precipitation Skill Scores

## 00:00 - 11:00 (UTC)

Heterog. L. C.

<i>Threshold</i>	<5 mm	10 mm	25 mm	40 mm	50 mm
<b>B</b>	nc	0.94	0.49	0.38	0.26
<b>T</b>	nc	0.84	0.36	0.34	0.26
<b>HSS</b>	nc	0.76	0.29	0.36	0.34
<b>POD</b>	nc	0.87	0.39	0.35	0.26
<b>FAR</b>	nc	0.06	0.20	0.00	0.00

Homog. L. C.

<i>Threshold</i>	<5 mm	10 mm	25 mm	40 mm	50 mm
<b>B</b>	nc	0.91	0.49	0.29	0.17
<b>T</b>	nc	0.81	0.36	0.22	0.17
<b>HSS</b>	nc	0.71	0.29	0.21	0.23
<b>POD</b>	nc	0.84	0.39	0.24	0.17
<b>FAR</b>	nc	0.06	0.20	0.20	0.00

Mean Observed Precipitation: 22 mm

- B: Bias
- T: Threat Score
- HSS: Heidke Threat Score
- POD: Prob. Of Detection
- FAR: False Alarm Rate

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# Cumulated Precipitation 00:00 - 24:00 (UTC)

Model Configuration

Sensitivity Analysis

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Internal Daily Report

Conclusions

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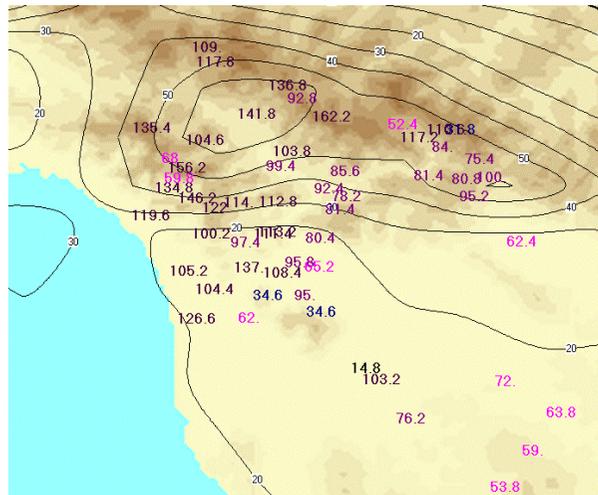
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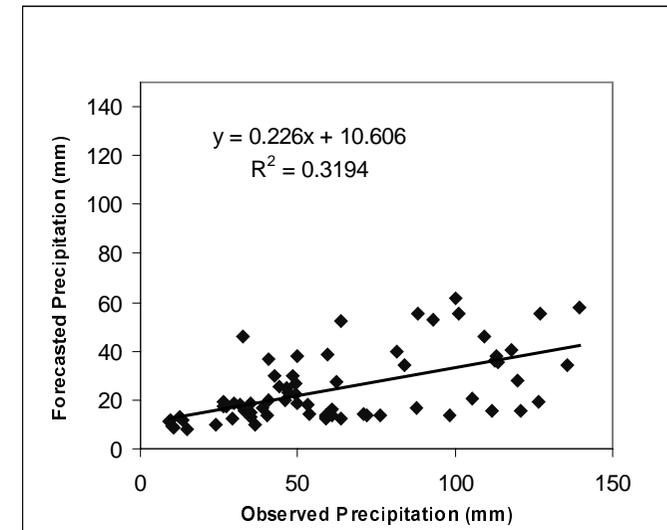
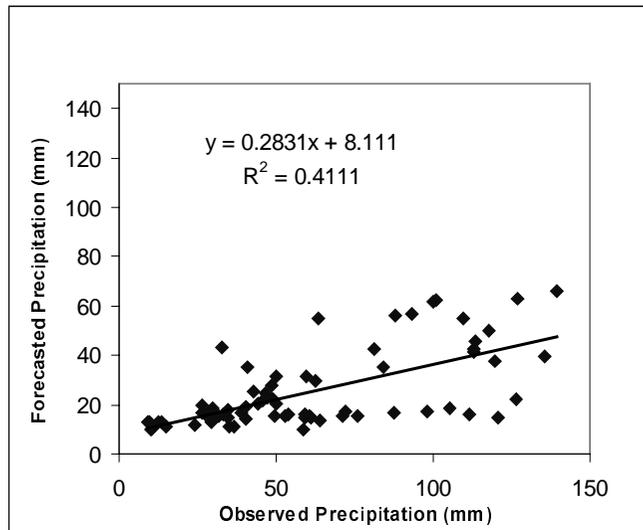
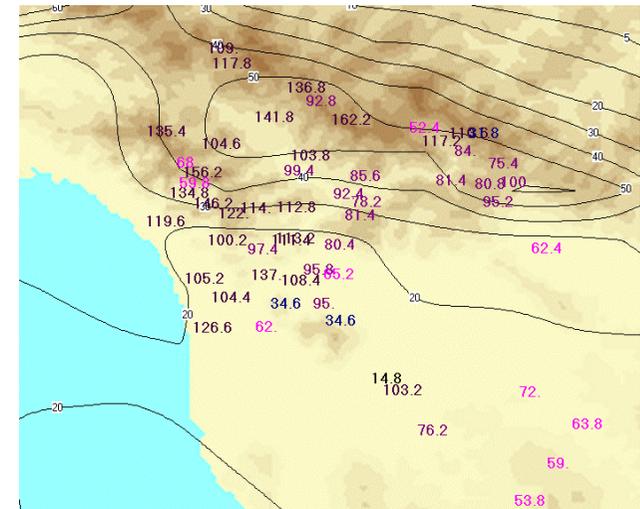
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Heterog. L. C.



Homog. L. C.



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# Precipitation Skill Scores

## 00:00 - 24:00 (UTC)

- Model Configuration 
- Sensitivity Analysis 
- QPF 
- Internal Daily Report 
- Conclusions 

### Heterog. L. C.

<i>Threshold</i>	<5 mm	10 mm	25 mm	40 mm	50 mm
<b>B</b>	nc	1.03	0.37	0.29	0.26
<b>T</b>	nc	0.97	0.37	0.27	0.26
<b>HSS</b>	nc	0.49	0.10	0.15	0.25
<b>POD</b>	nc	0.99	0.37	0.27	0.26
<b>FAR</b>	nc	0.03	0.00	0.07	0.00

### Homog. L. C.

<i>Threshold</i>	<5 mm	10 mm	25 mm	40 mm	50 mm
<b>B</b>	nc	0.98	0.40	0.21	0.20
<b>T</b>	nc	0.93	0.40	0.18	0.20
<b>HSS</b>	nc	0.25	0.12	0.09	0.20
<b>POD</b>	nc	0.95	0.40	0.19	0.20
<b>FAR</b>	nc	0.03	0.00	0.10	0.00

Mean Observed Precipitation: 67 mm

- B: Bias
- T: Threat Score
- HSS: Heidke Threat Score
- POD: Prob. Of Detection
- FAR: False Alarm Rate

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# DeciDe - QPF - Evaluation

## ARNO River Basin

Decision Support Demonstration  
An European Space Agency Project

- Model Configuration
- Sensitivity Analysis
- QPF
- Internal Daily Report
- Conclusions

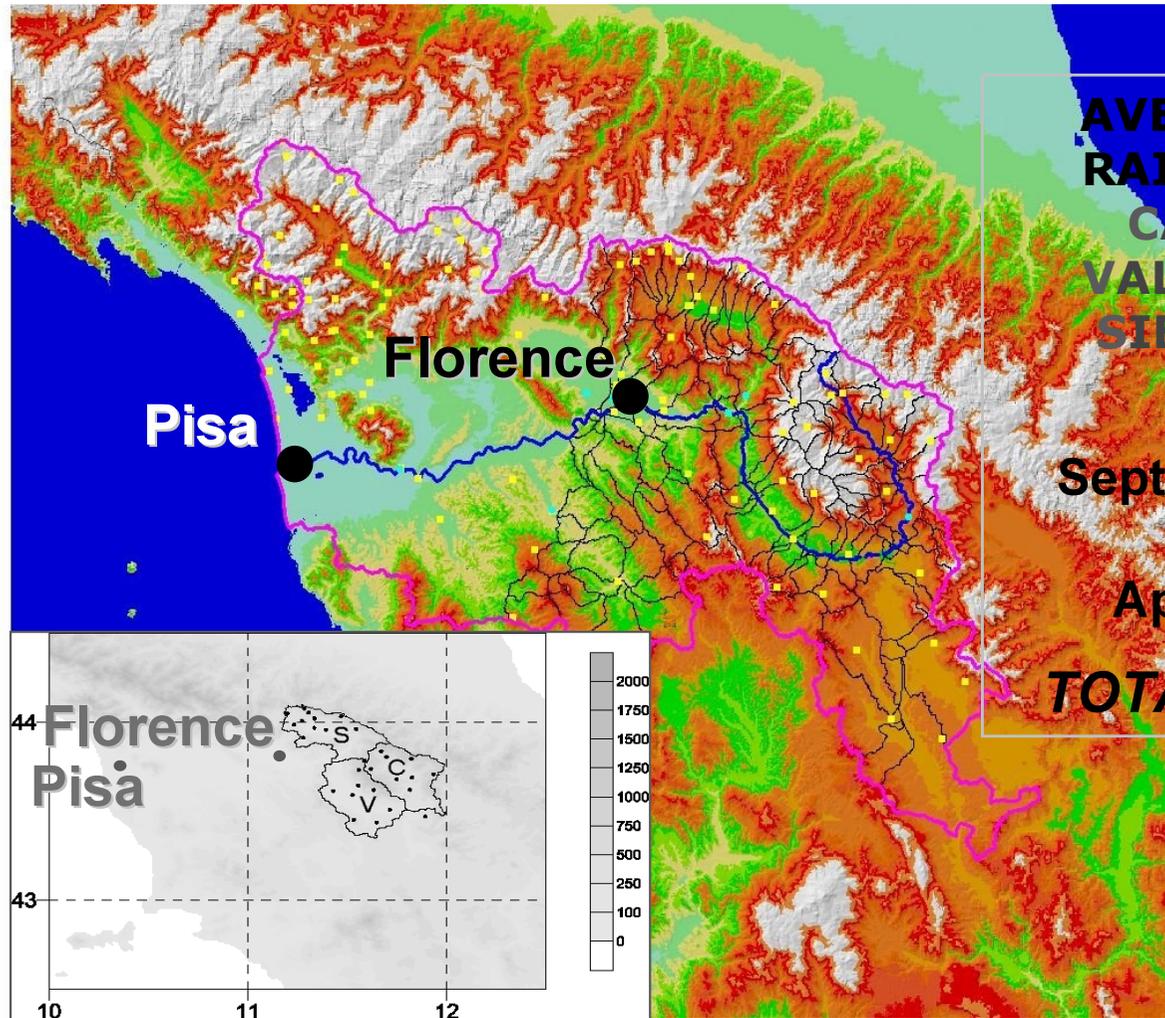
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**AVERAGE DAILY  
RAINFALL OVER  
CASENTINO,  
VALDARNO AND  
SIEVE BASINS**

**PERIOD:**

**September 1<sup>th</sup> 1999**

**to**

**April 30<sup>th</sup> 2000**

**TOTAL: 164 DAYS**

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# QPF Evaluation

Model Configuration

Sensitivity Analysis

QPF

Internal Daily Report

Conclusions

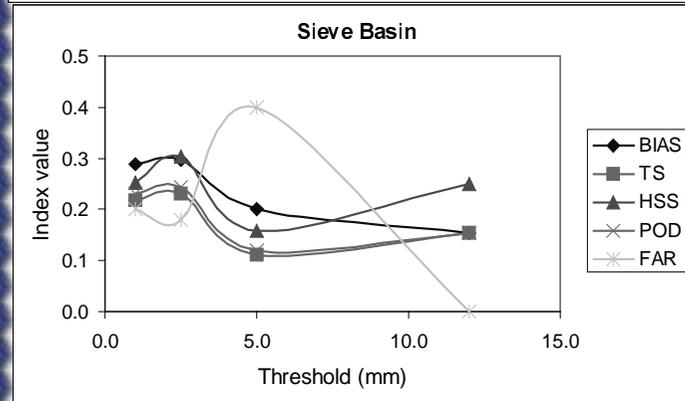
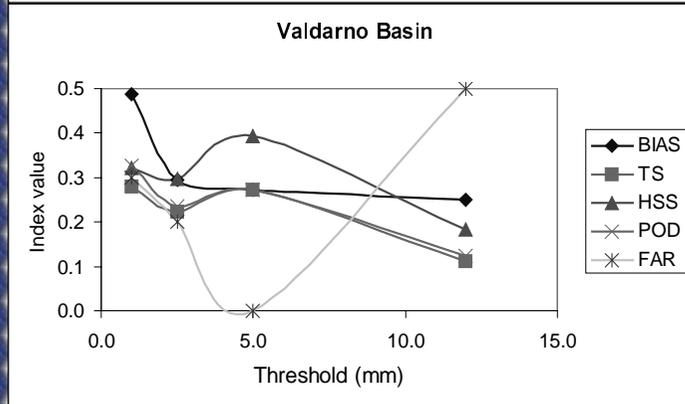
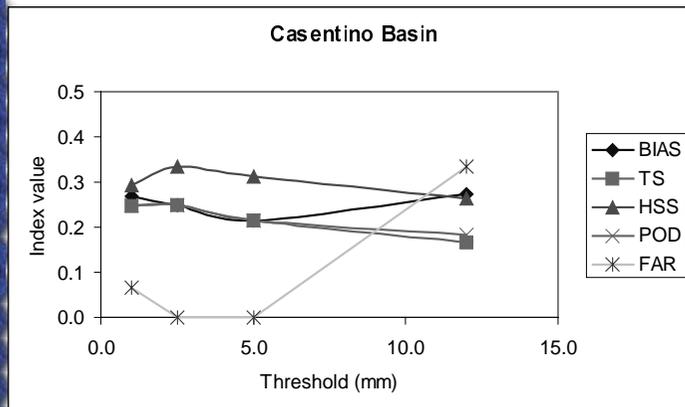
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Threshold	BIAS	TS	HSS	POD	FAR
1.0	0.27	0.25	0.29	0.25	0.07
2.5	0.25	0.25	0.34	0.25	0.00
5.0	0.21	0.21	0.31	0.21	0.00
12.0	0.27	0.17	0.26	0.18	0.33

Threshold	BIAS	TS	HSS	POD	FAR
1.0	0.49	0.28	0.32	0.33	0.30
2.5	0.29	0.22	0.30	0.24	0.20
5.0	0.27	0.27	0.39	0.27	0.00
12.0	0.25	0.11	0.18	0.13	0.50

Threshold	BIAS	TS	HSS	POD	FAR
1.0	0.29	0.22	0.25	0.23	0.20
2.5	0.30	0.23	0.30	0.24	0.18
5.0	0.20	0.11	0.16	0.12	0.40
12.0	0.15	0.15	0.25	0.15	0.00

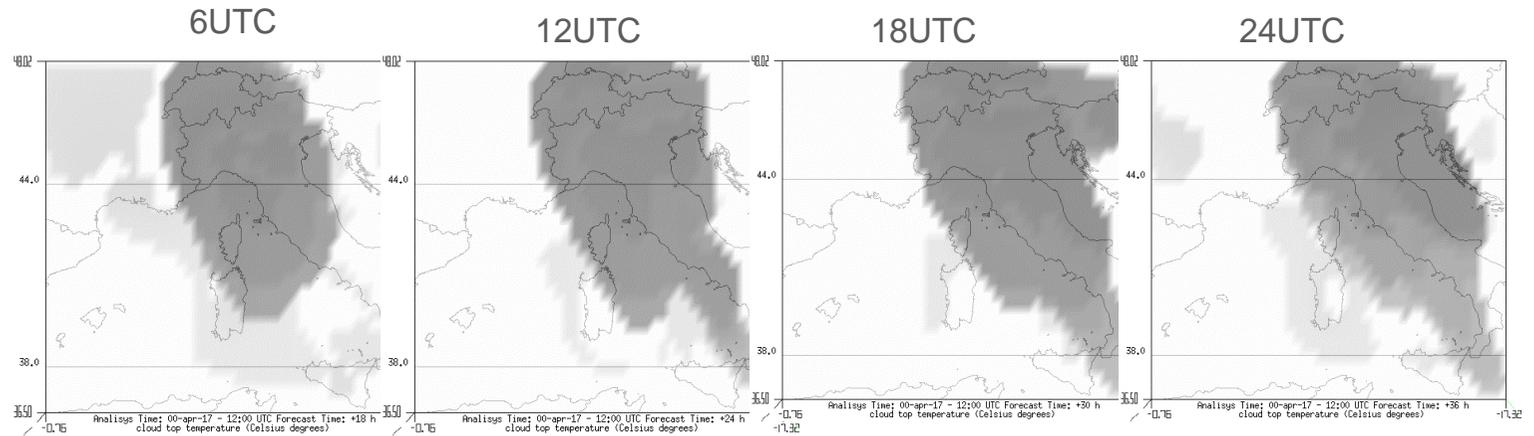
<http://www.lamma.rete.toscana.it>



# Daily Forecast Internal Report

18 / 4 / 2000  
Prec. Report

## Cloud Top Temperature Forecast



## Cloud Top Temperature Meteosat



- Model Configuration
- Sensitivity Analysis
- QPF
- Internal Daily Report
- Conclusions

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Model Configuration

Sensitivity Analysis

QPF

Internal Daily Report

Conclusion

# Conclusion

- RAMS demonstrates operational capabilities even it requires large computer power.
- The very detailed land use description is crucial to get mesoscale structures.
- The QPF quality is just a step under the quality threshold needed by hydrological forecasting system.

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