EGS-AGU-EUG Joint Assembly, Nice, France, 6 - 11 April 2003

Session: Hydrological Sciences **HS12**

Rainfall modelling: scaling and non-scaling approaches

A CASE STUDY OF SPATIAL-TEMPORAL RAINFALL DISAGGREGATION AT THE TIBER RIVER, ITALY

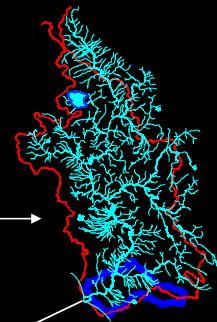*Paola Fytilas[1] , Demetris Koutsoyiannis[2], Francesco Napolitano[1]*

[1] Department of Hydraulics, University of Rome "La Sapienza",

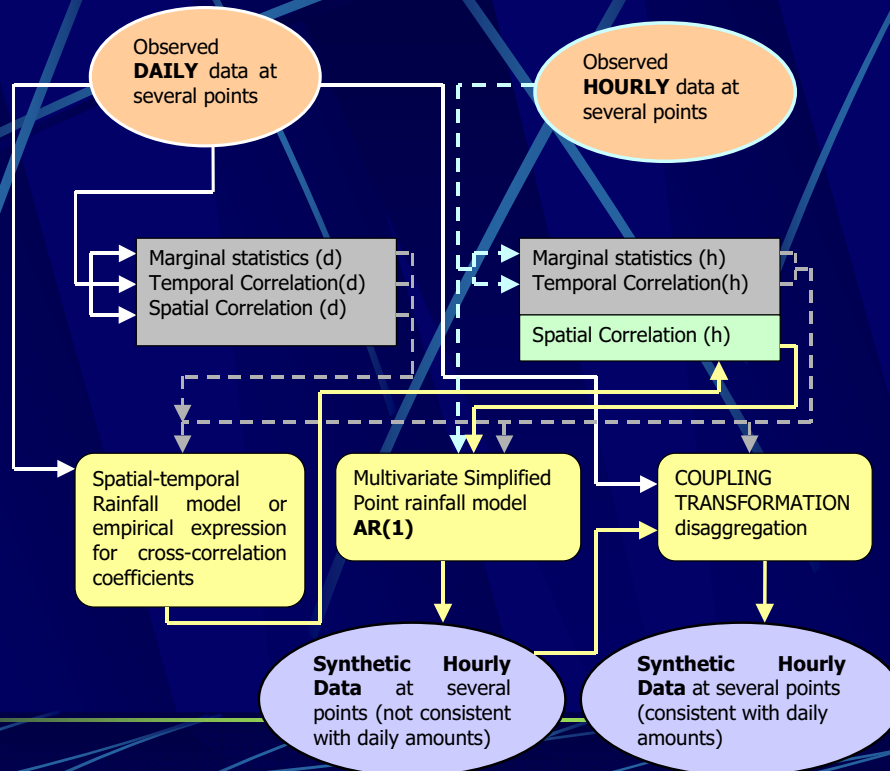*[2] Department of Water Resources, National Technical University of Athens*

Study Area: **Aniene River Catchment-Tiber River-Central Italy**
Data period:**January 1994-December 1999**

- Raingauges with hourly data used in the generation phase
- Raingauges with hourly data used to evaluate the effectiveness of the methodology
- Raingauges with daily data only

8.ROMA ACQUA ACETOSA
1.TIVOLI
2.LUNGHEZZA
4.PONTE SALARIO
5.ROMA FLAMINIO
7.PANTANO BORGHESE
6.ROMA MACAO
3.FRASCATI
F. Aniene

The Methodology

Observed **DAILY** data at several points

Observed **HOURLY** data at several points

Marginal statistics (d)
Temporal Correlation(d)
Spatial Correlation (d)

Marginal statistics (h)
Temporal Correlation(h)

Spatial Correlation (h)

Spatial-temporal Rainfall model or empirical expression for cross-correlation coefficients

Multivariate Simplified Point rainfall model **AR(1)**

COUPLING TRANSFORMATION disaggregation

Synthetic Hourly Data at several points (not consistent with daily amounts)

Synthetic Hourly Data at several points (consistent with daily amounts)

Parameter Estimation

Essential statistics to preserve in the generated hourly series :

1. the means, variances and coefficients of skewness;

2. the temporal correlation structure (autocorrelations);

3. the spatial correlation structure (lag zero cross-correlations); and

4. the proportions of dry intervals.

Daily time scale: estimated directly using the data set available for all raingauges

Hourly time scale: All the statistics, including the cross-correlations coefficients between gages 1,2,3 can be estimated directly from the data set available at these locations.
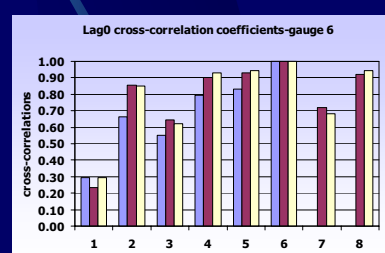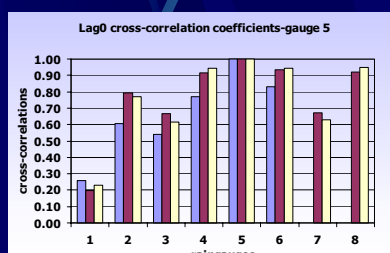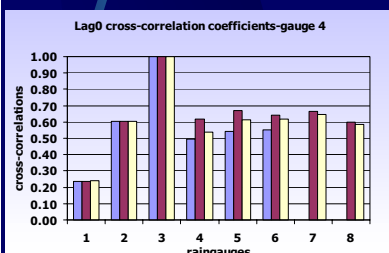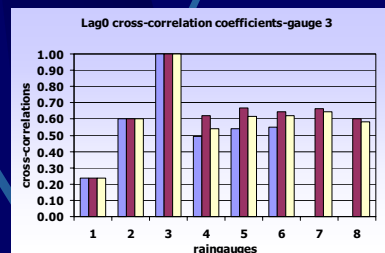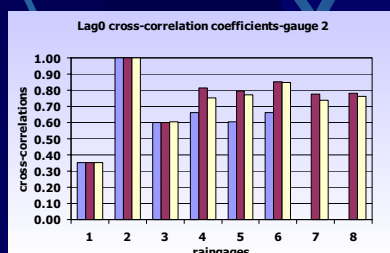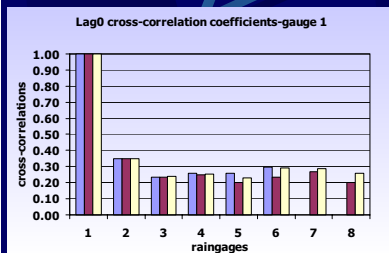
The unknown cross-correlation coefficients at hourly level were estimated indirectly

using the empirical relationship:
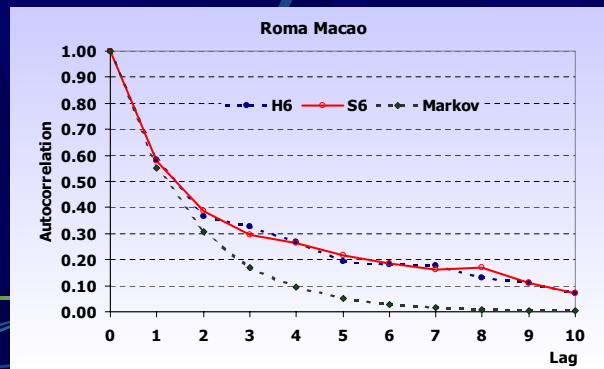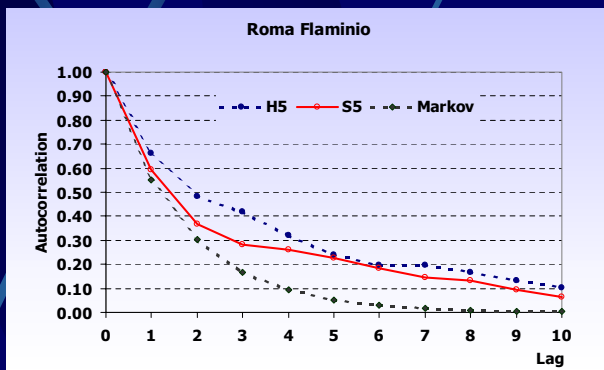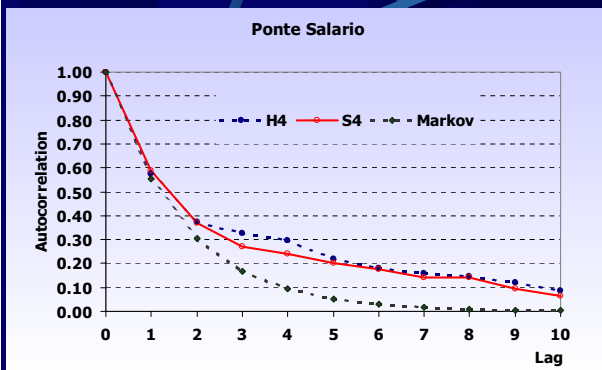
$$(r_{ij})_h = (r_{ij})_d^m$$

Preservation of marginal statistics
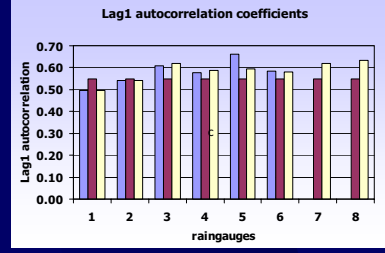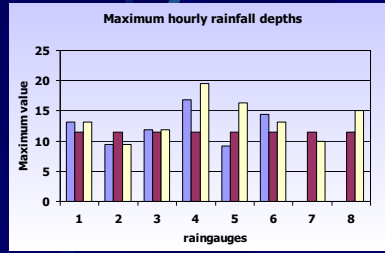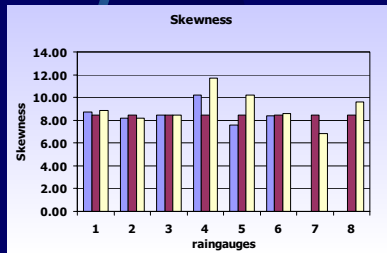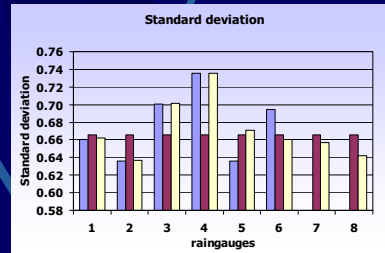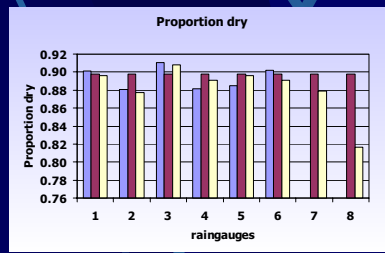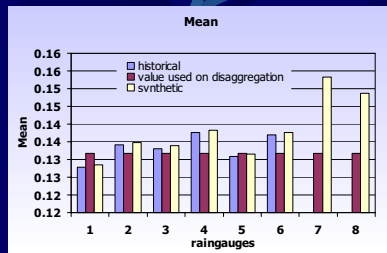
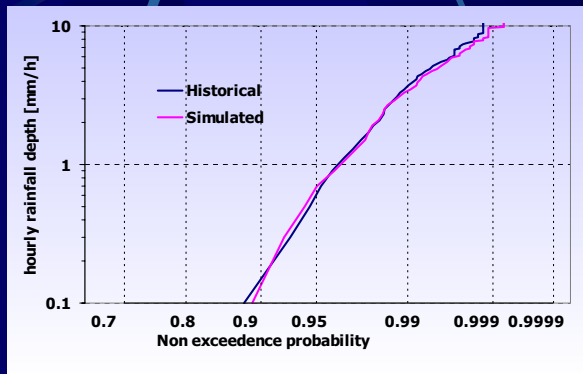# Preservation of cross correlation coefficients

Preservation of autocorrelation coefficients

Ponte Salario

Roma Flaminio
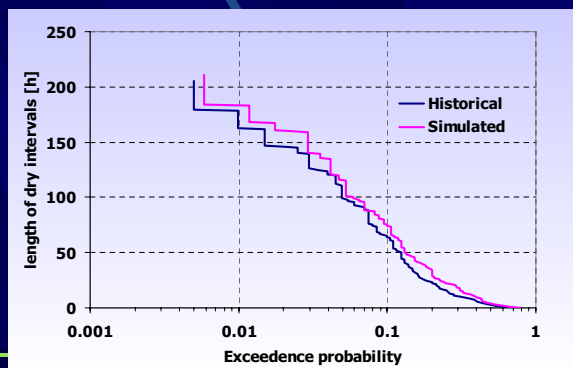

Roma Macao

Preservation of probability distribution functions at gauge Ponte Salario

Hourly rainfall depths

Length of dry intervals

Preservation of historical hyetographs