



Preliminary comparison of MÉRA precipitation estimates with radar and rain-gauge data for flood estimation.

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Introduction

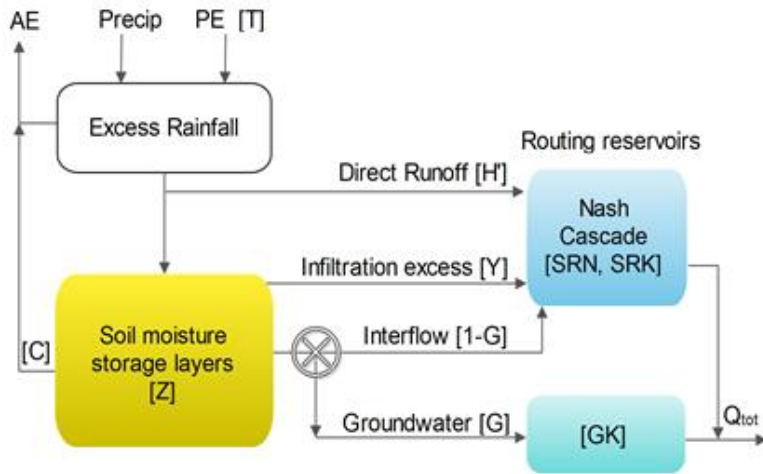
1. Effect of precipitation information type on flood forecasting
2. Lumped conceptual catchment model (SMART)
3. Caveat : Calibration results shown here
4. Two nested Periods studied (each separately calibrated)

2001- 2003 Preliminary MÉRA data

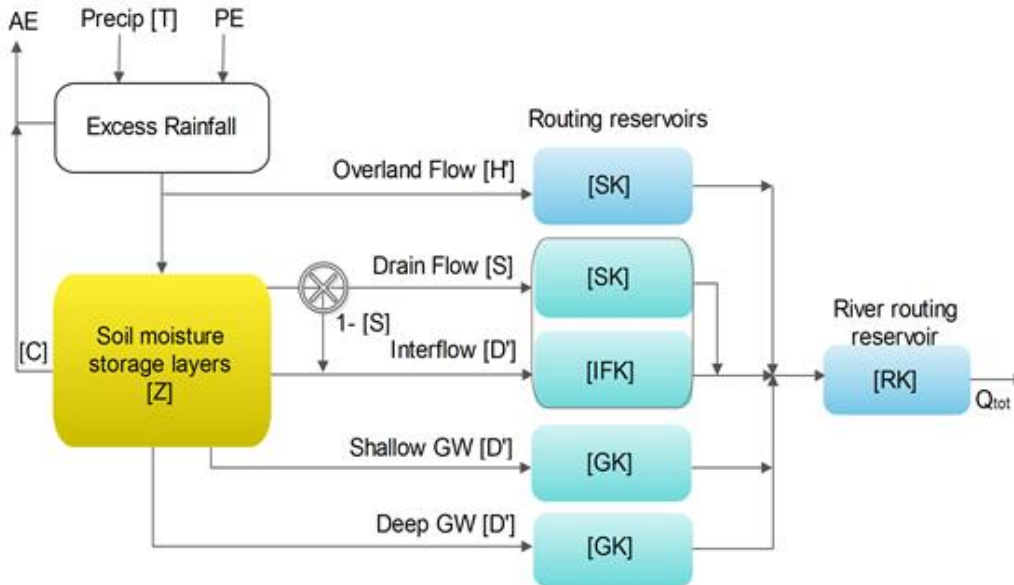
2001- 2012 (Radar technology changed in period)

Catchment model used

b) SMARG

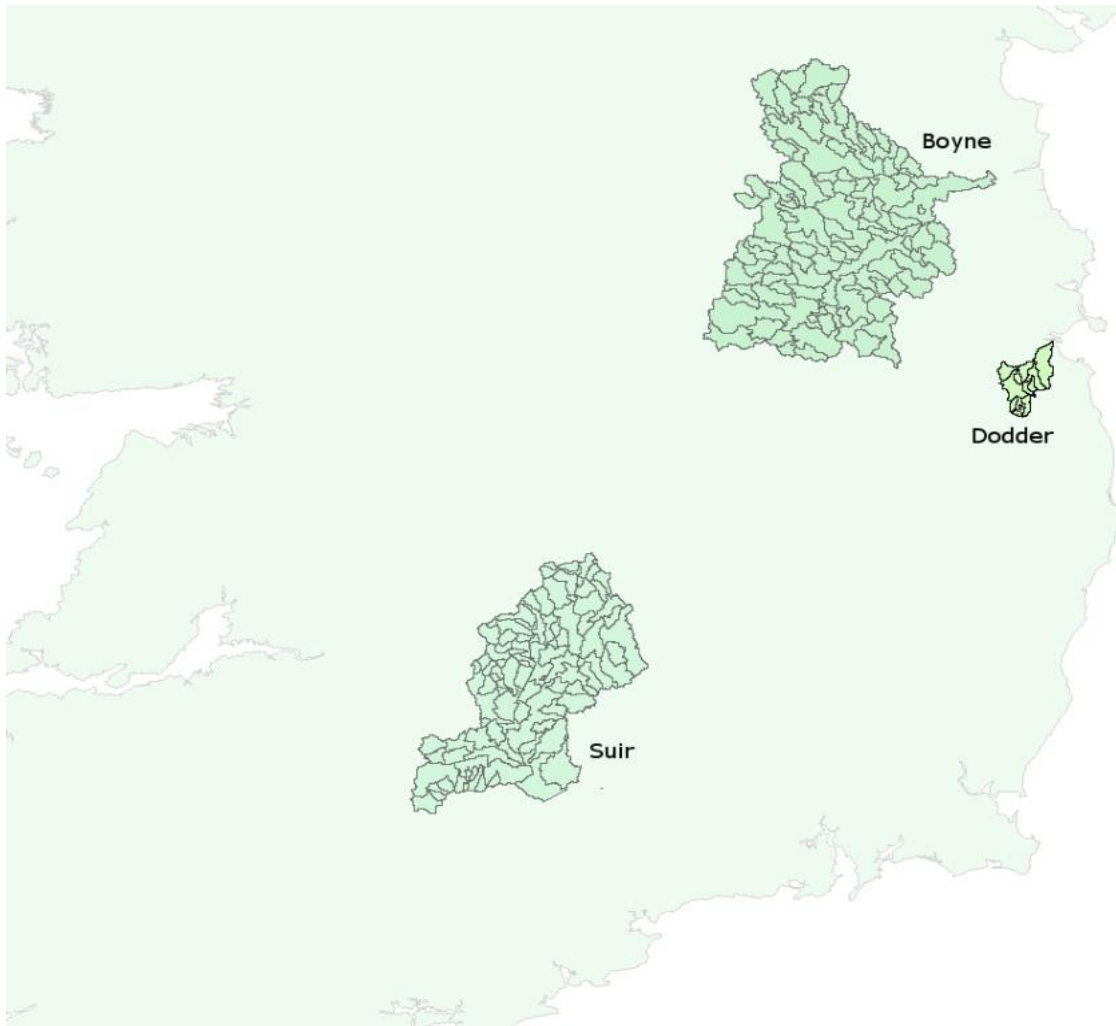


c) SMART

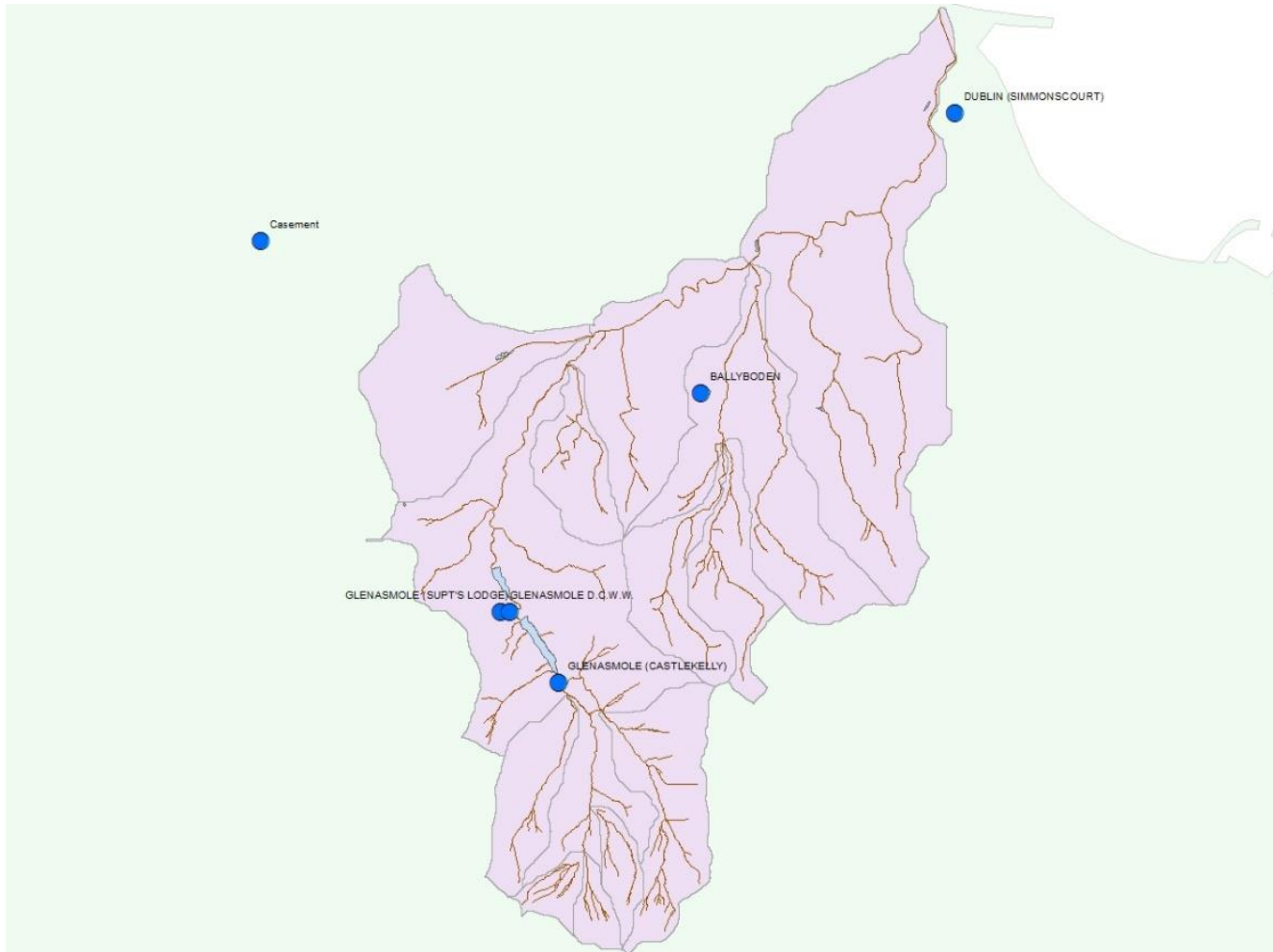


SMART
Catchment RR
Model
adopted from
SMARG

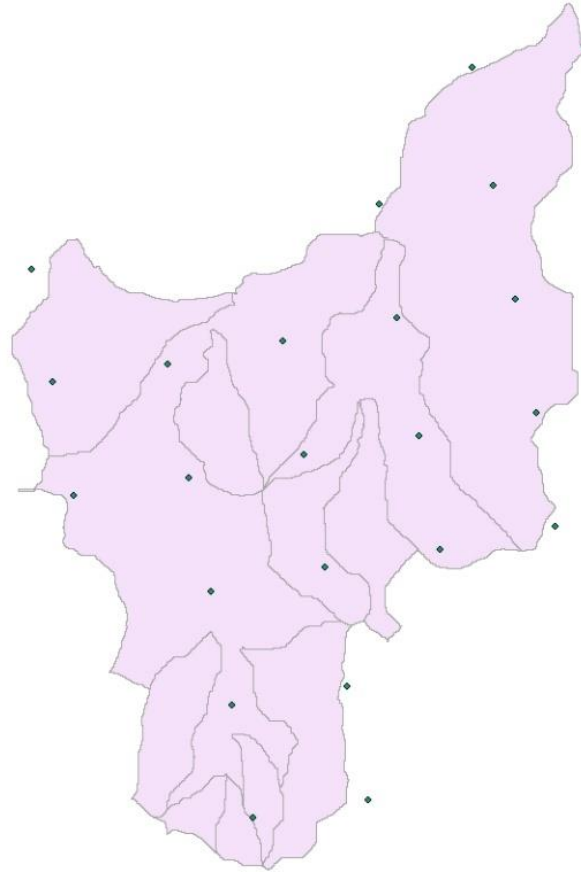
Locations of Test Catchments



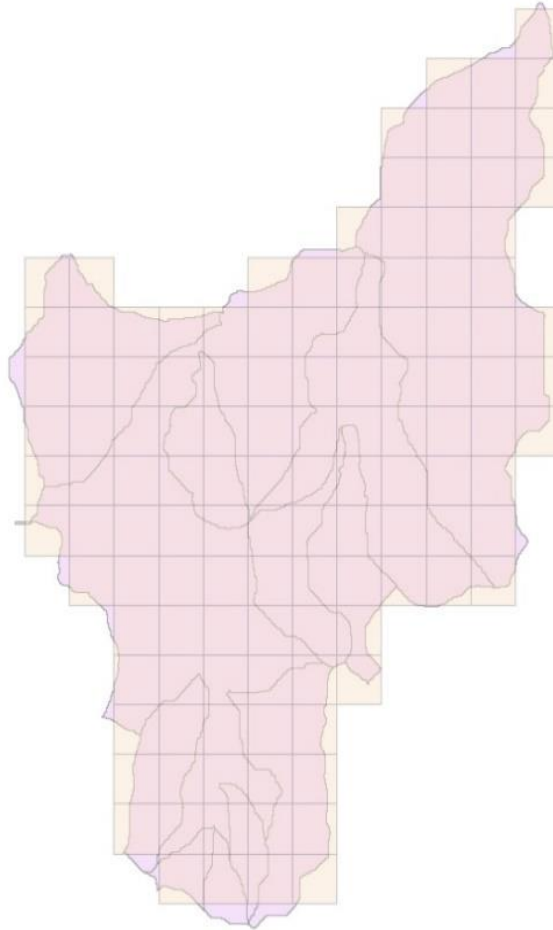
Dodder Rain gauges



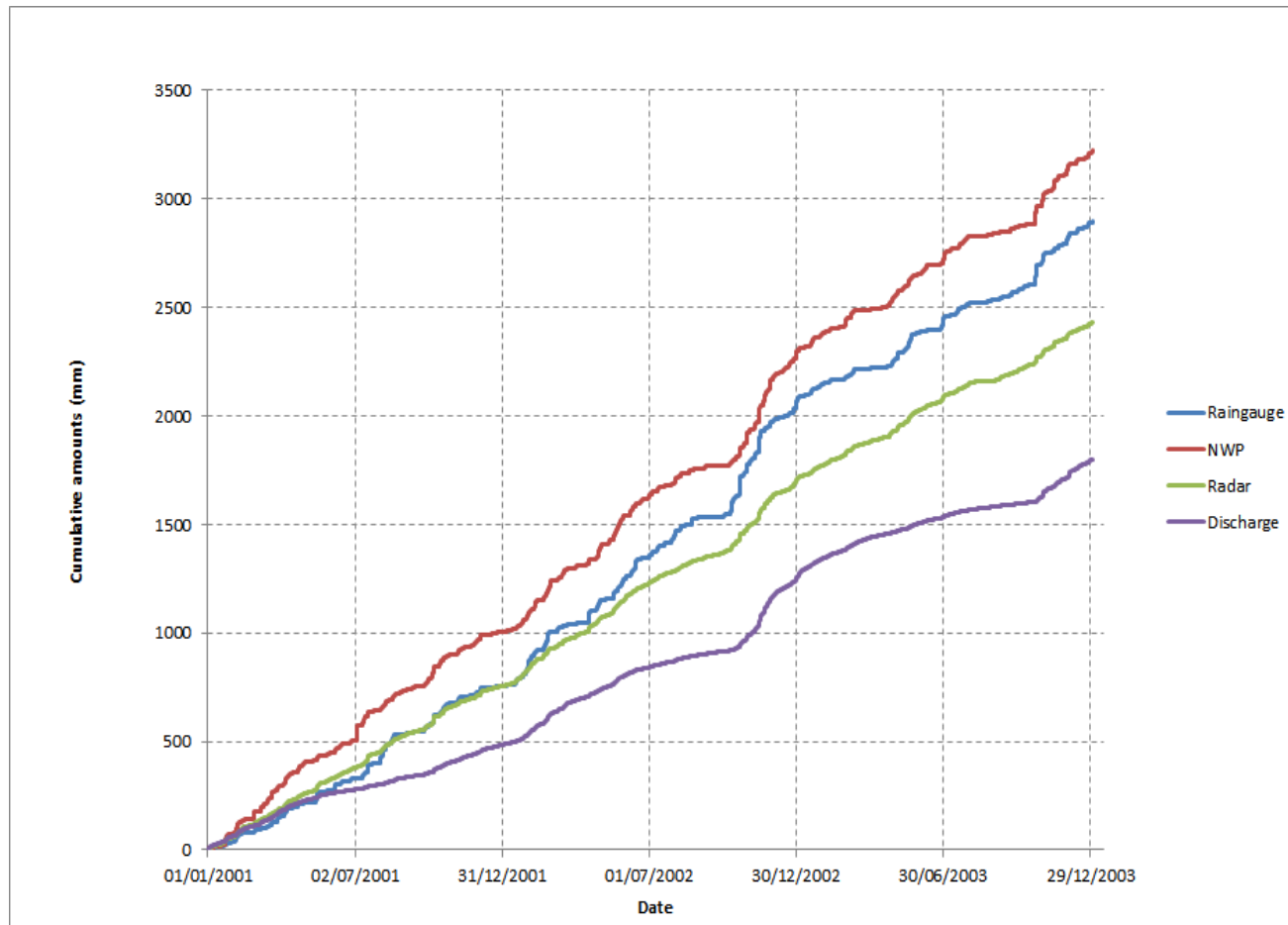
Dodder -MÉRA grid points



Dodder Radar cells



Raw data – Partial cumulatives

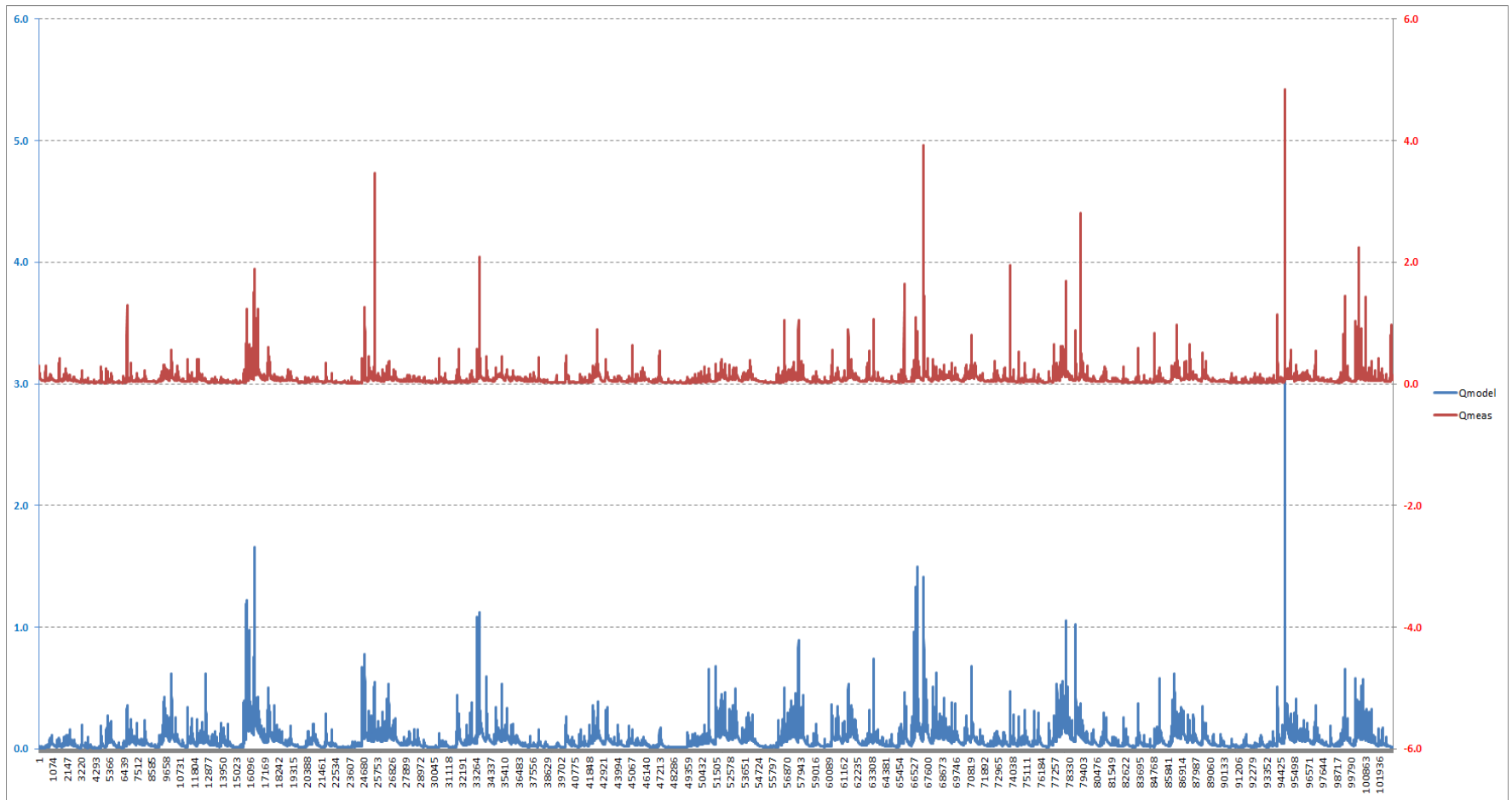


Overall Results Dodder

Fitting Statistics	RainGauge	MÉRA	Radar
Mean Bias	-0.016	-0.0025	-0.0088
MeanAbsResidual	0.031	0.030	0.034
RMSE	0.070	0.084	0.076
NS-R:	0.47	0.21	0.36

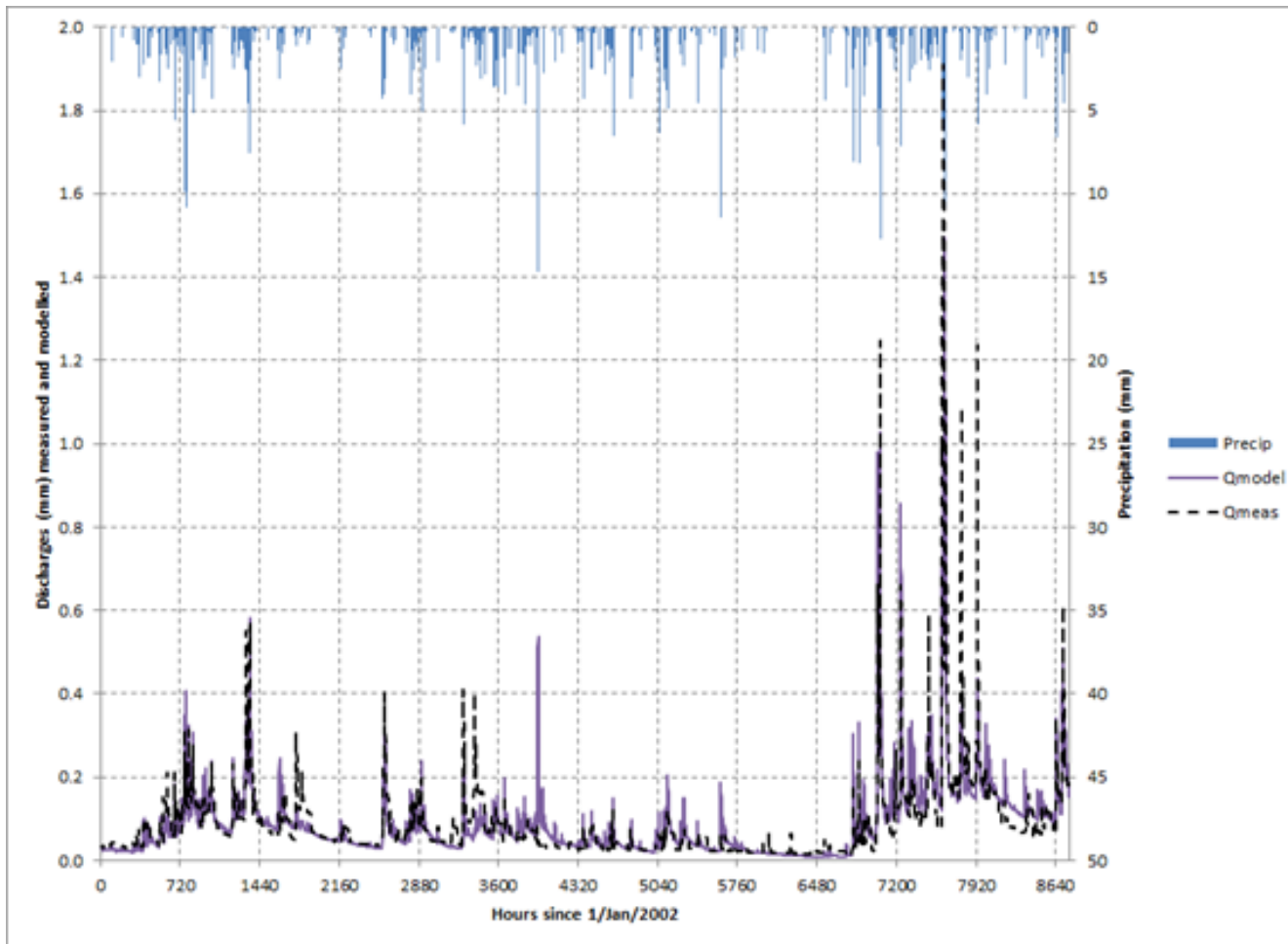
Dodder flows (mm)

Scaled Casement data

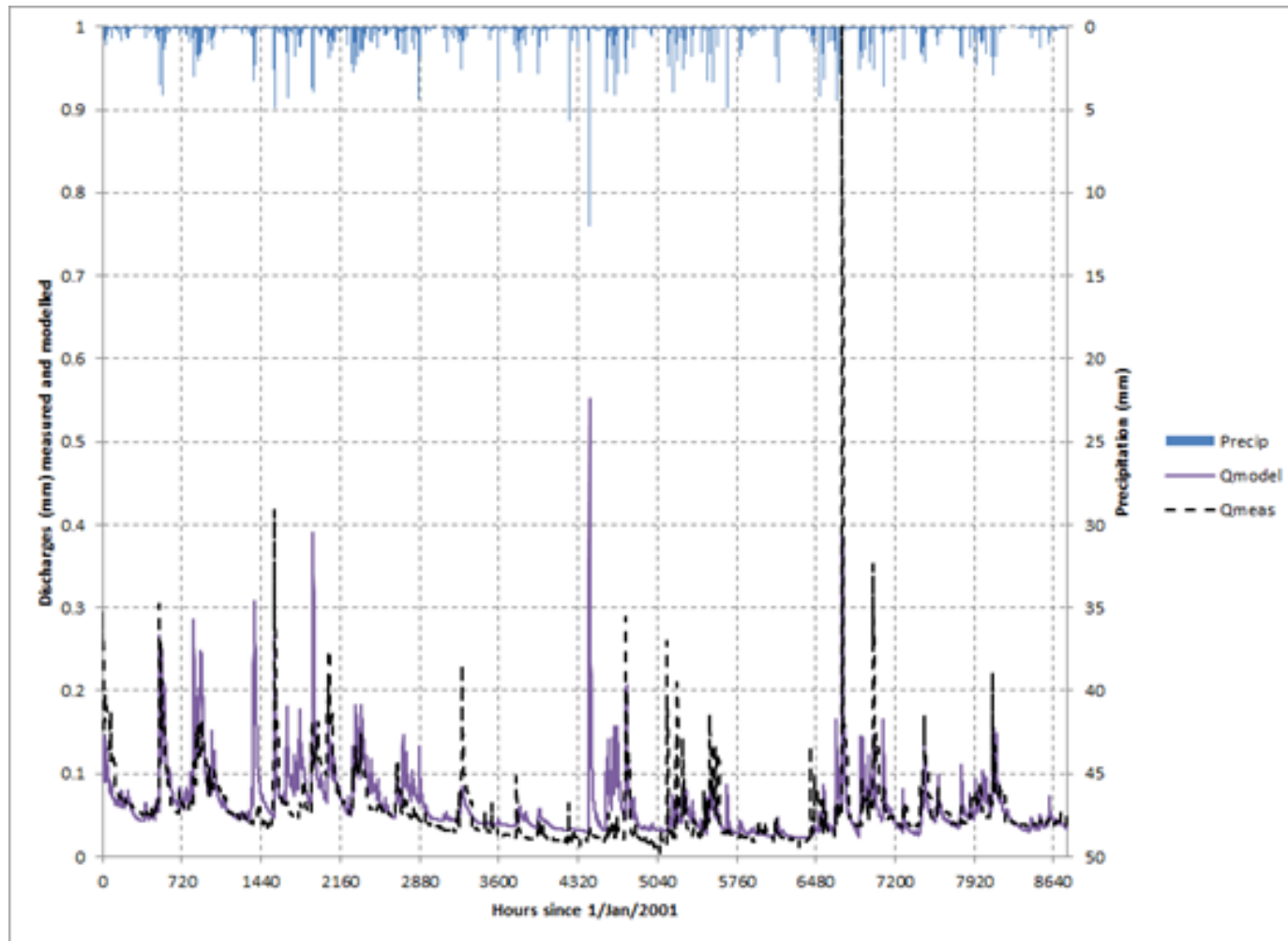


Dodder flows (mm) - 2001

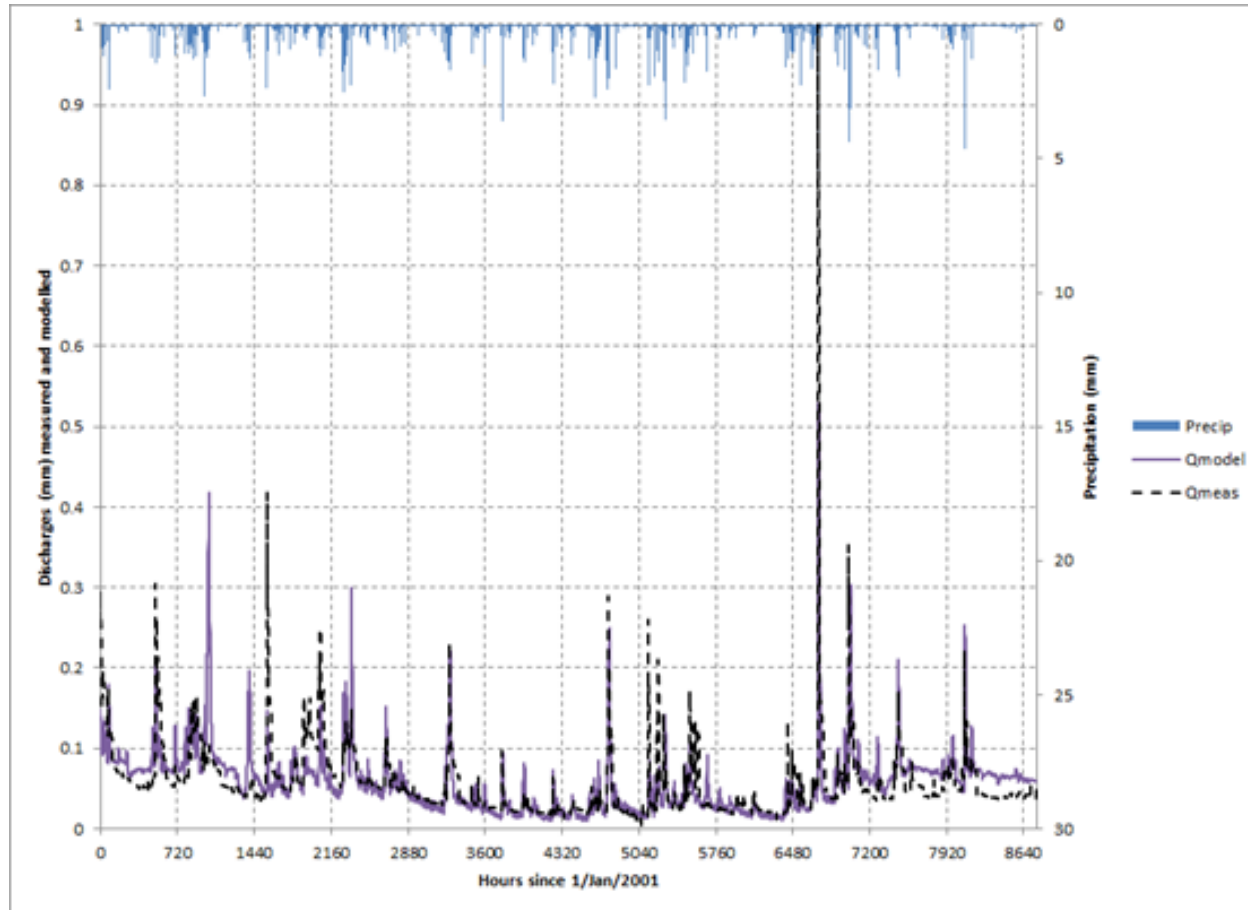
Scaled Casement data



Dodder flows (mm) MÉRA - 2001



Dodder flows (mm) Radar -2001



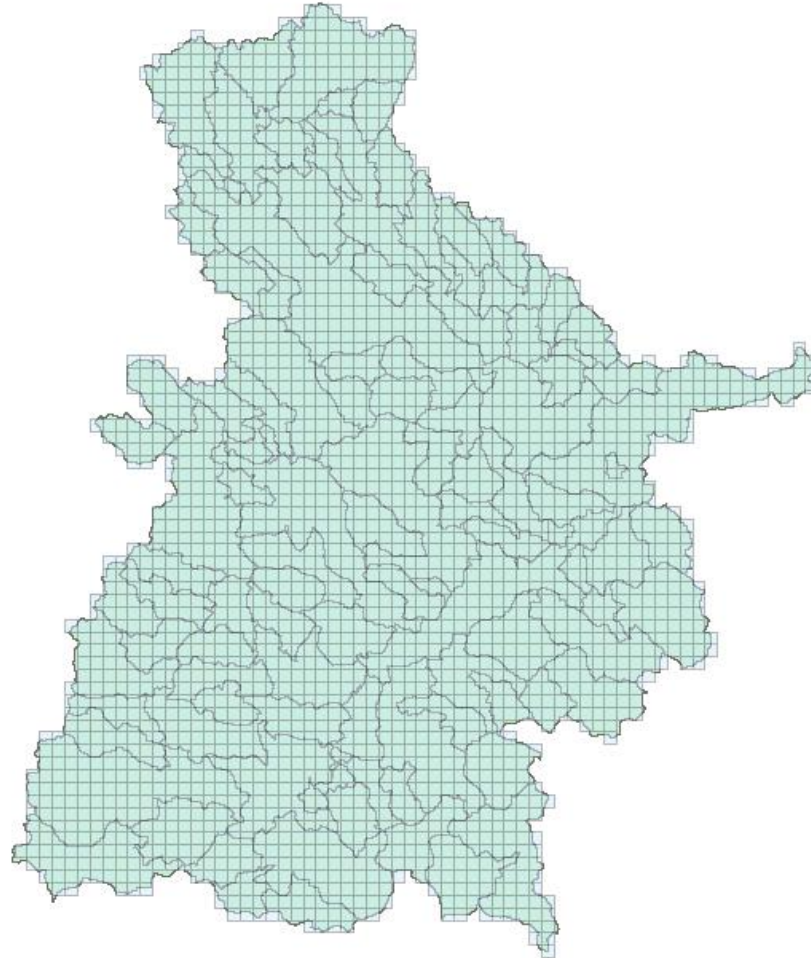
Boyerne Catchment (raingauges)



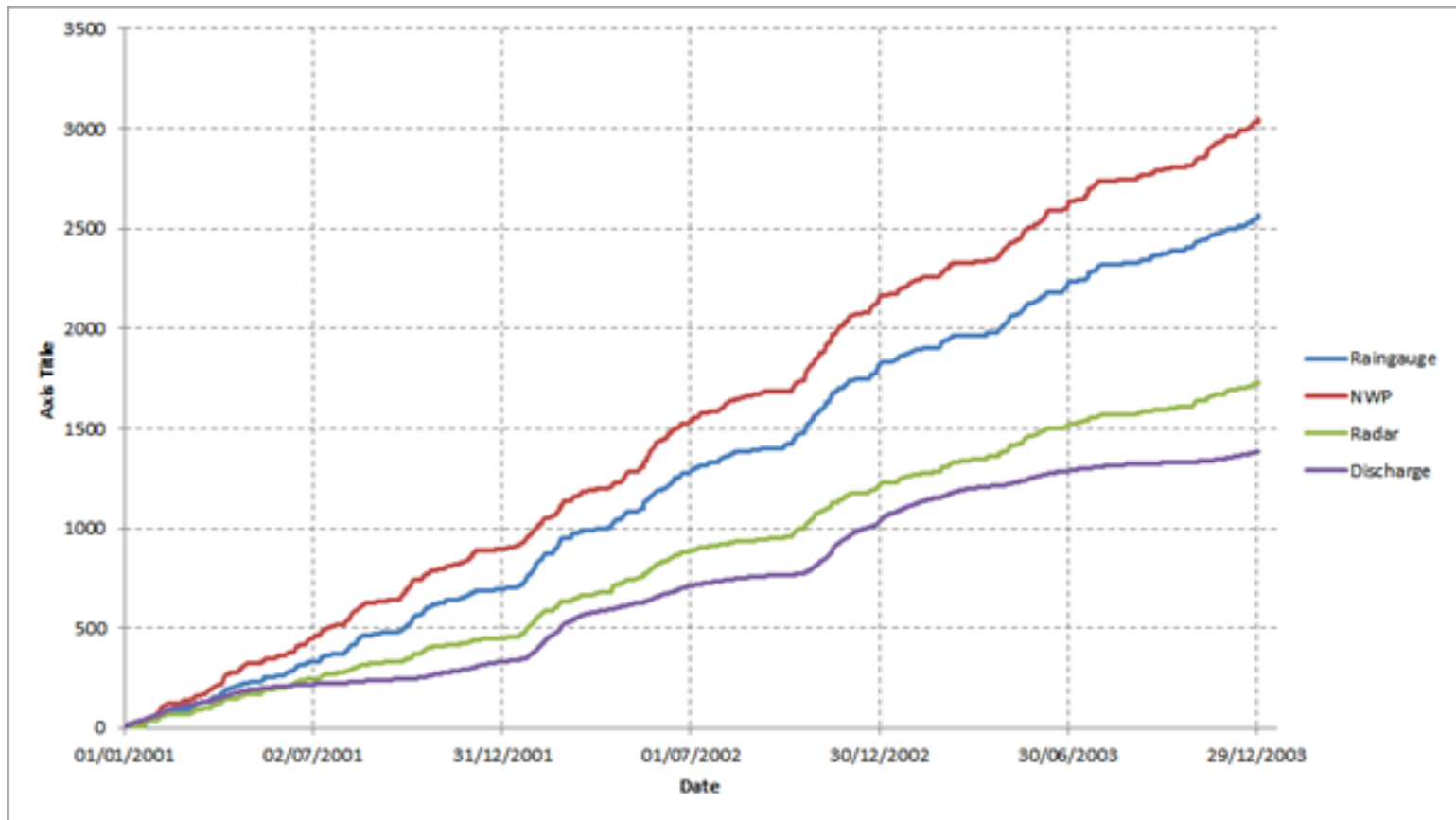
Boyne Catchment MÉRA grid



Boyne Catchment Radar cells



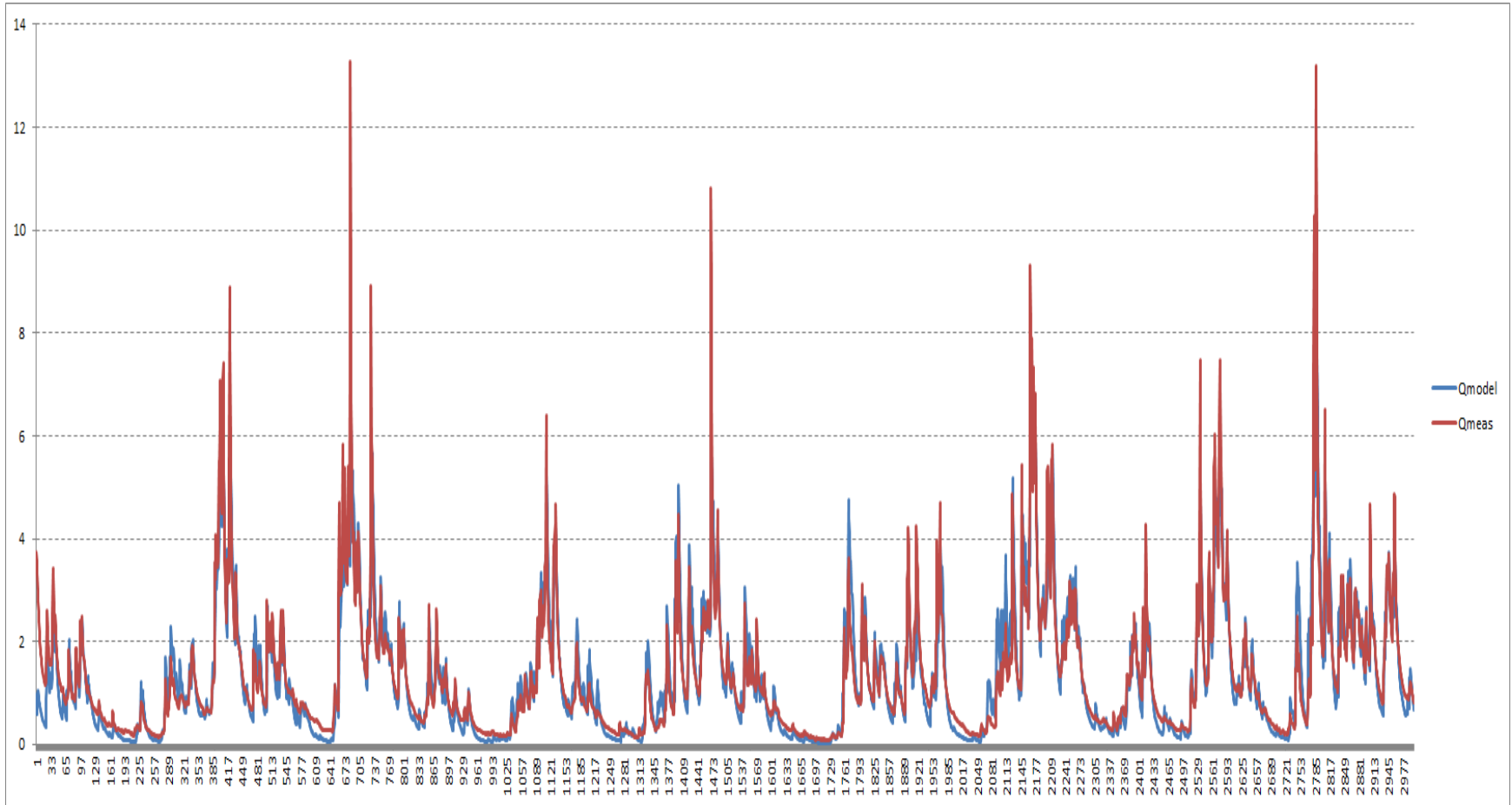
Boyne catchment raw data (2001-2003)



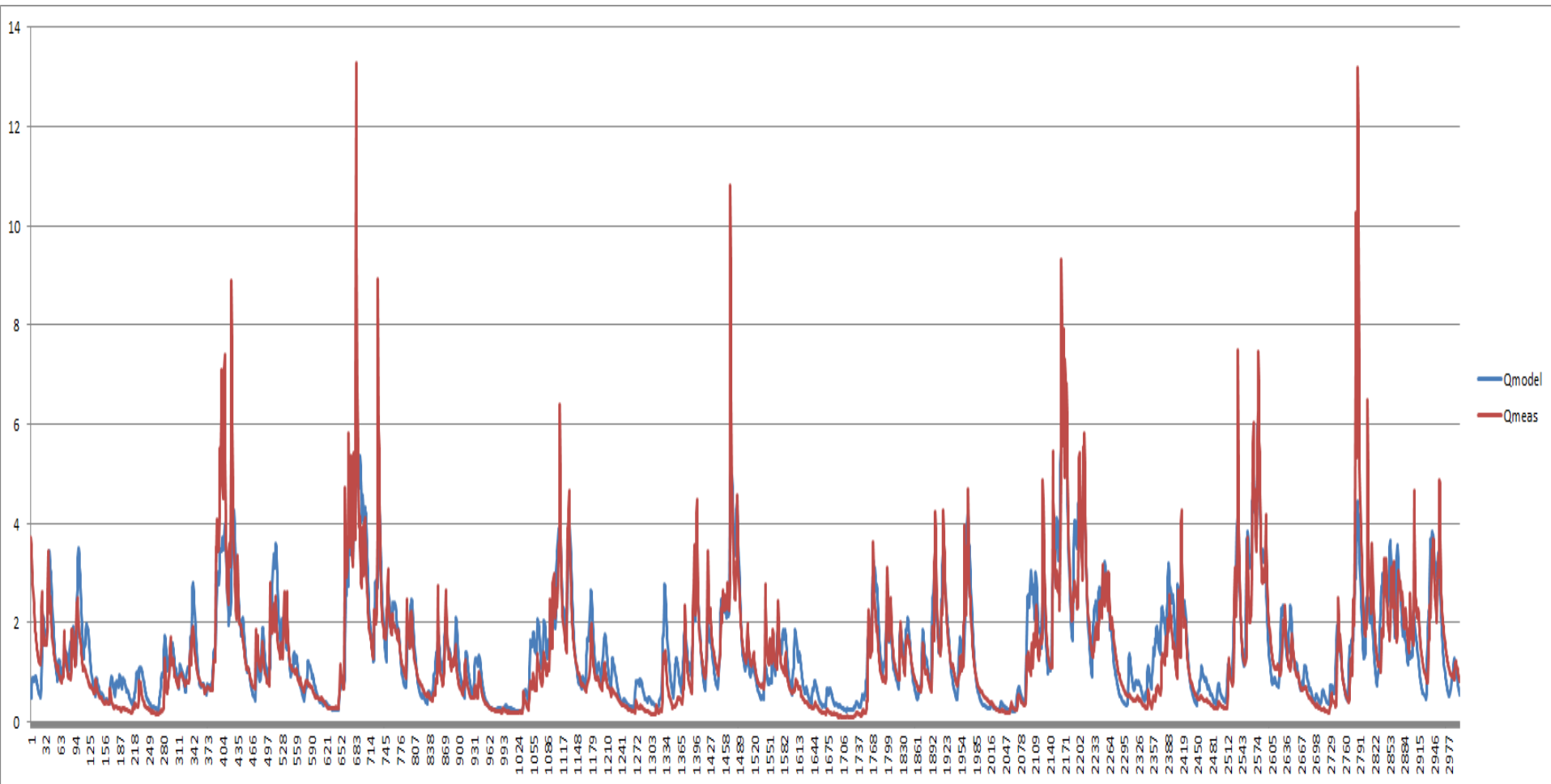
Boyne Catchment Overall Results

Fitting Statistics	RainGauge	MÉRA	Radar
Mean Bias	-0.036	0.092	-0.163
MeanAbsResidual	0.28	0.42	0.69
RMSE	0.525	0.704	1.107
NS-R:	0.84	0.72	0.30

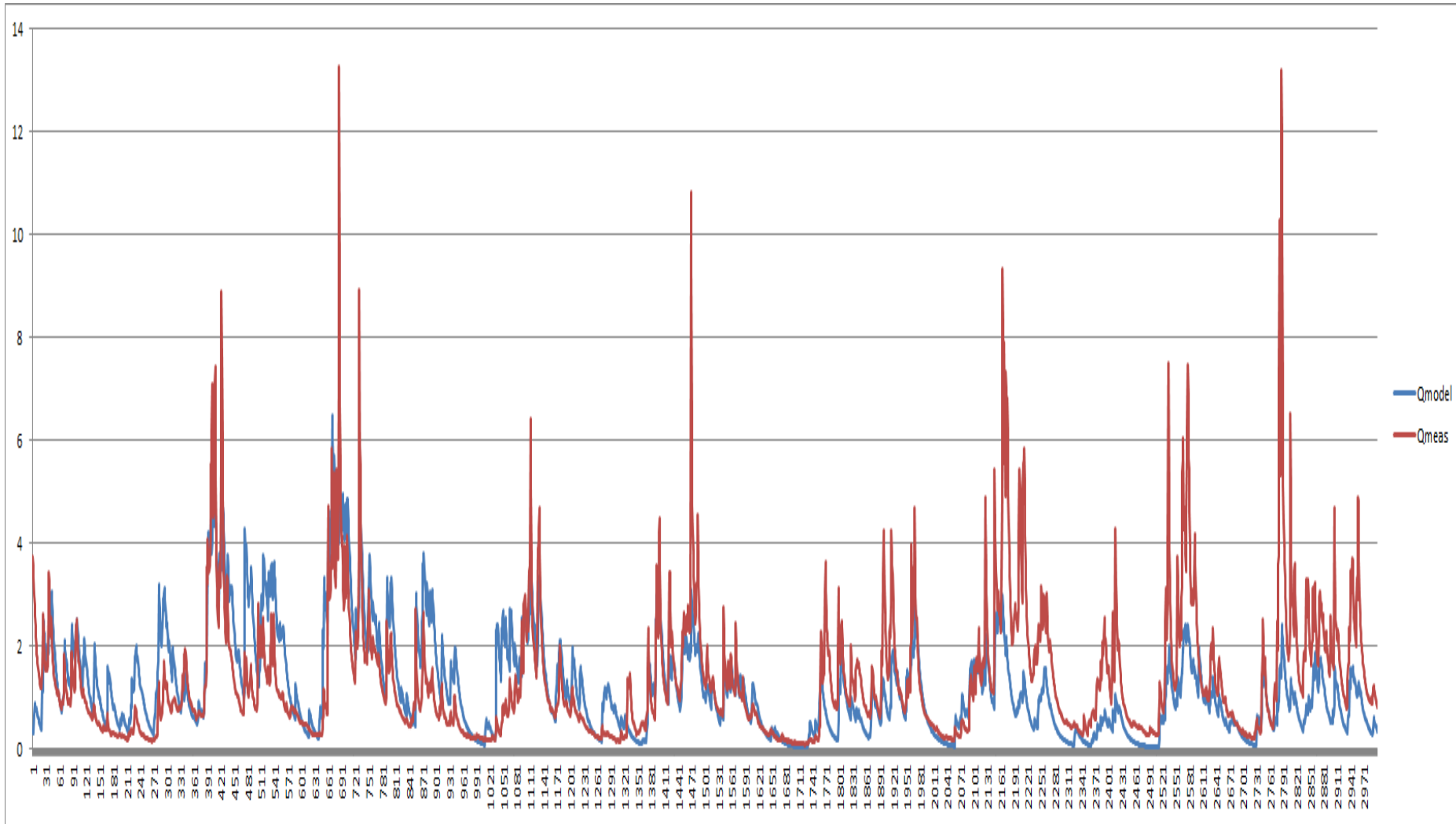
Boyne – Flows(mm) Raingauge data



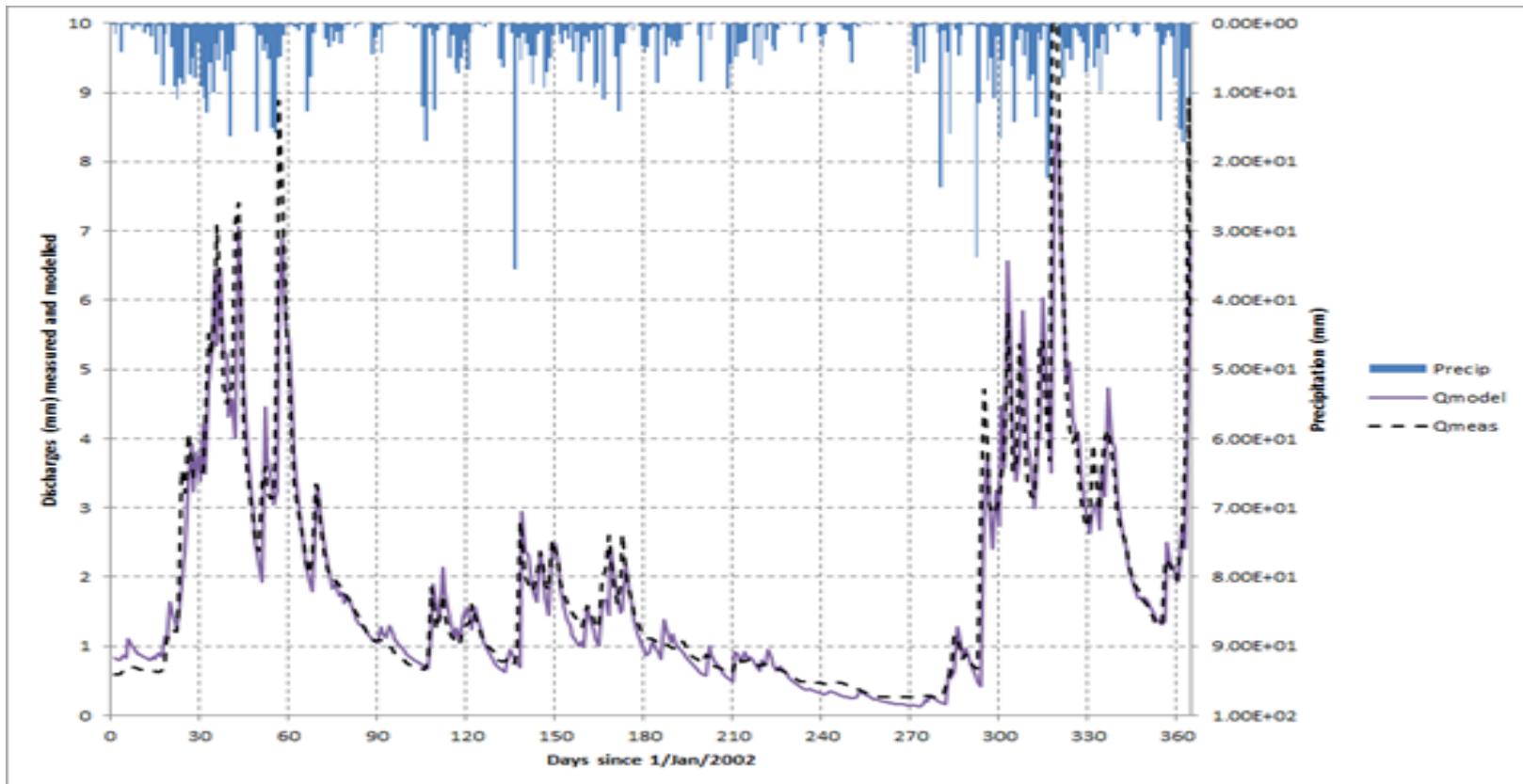
Boyne – Flows(mm) MÉRA data



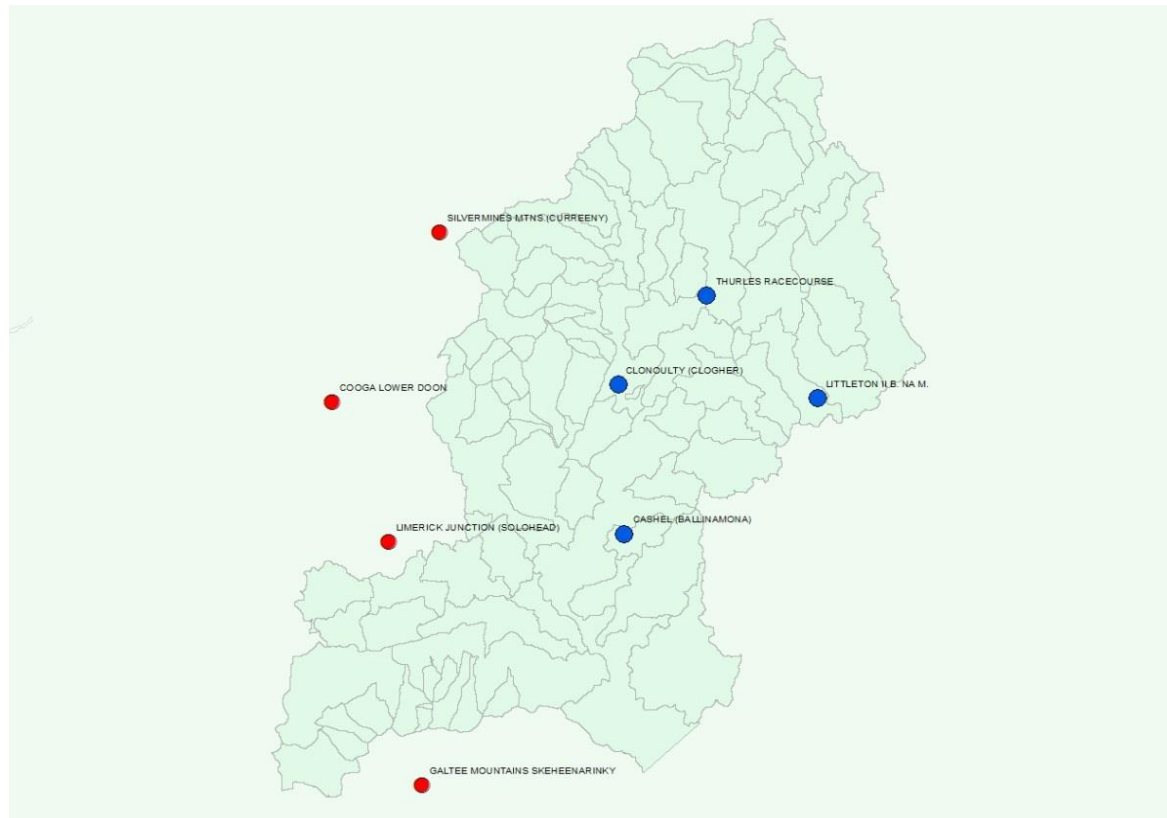
Boyne – Flows(mm) Radar



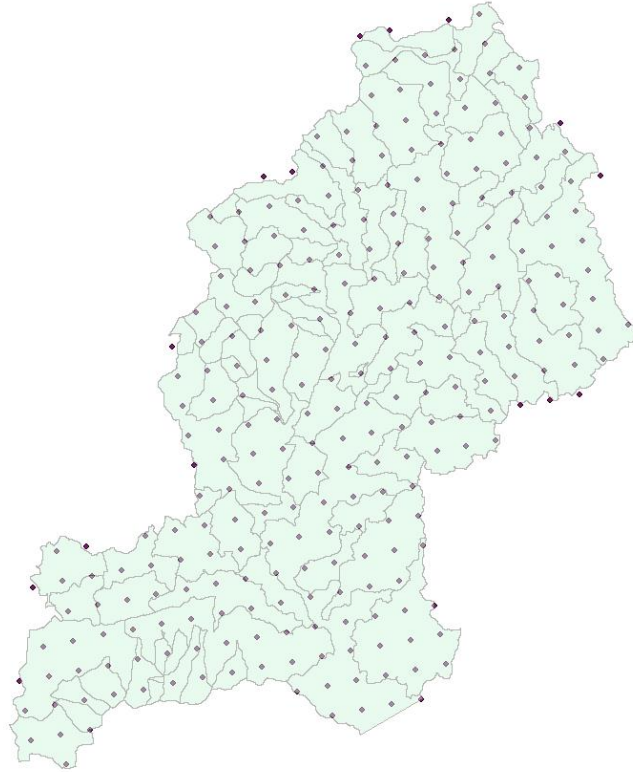
Boyne – Flows(mm) Raingauges 2002



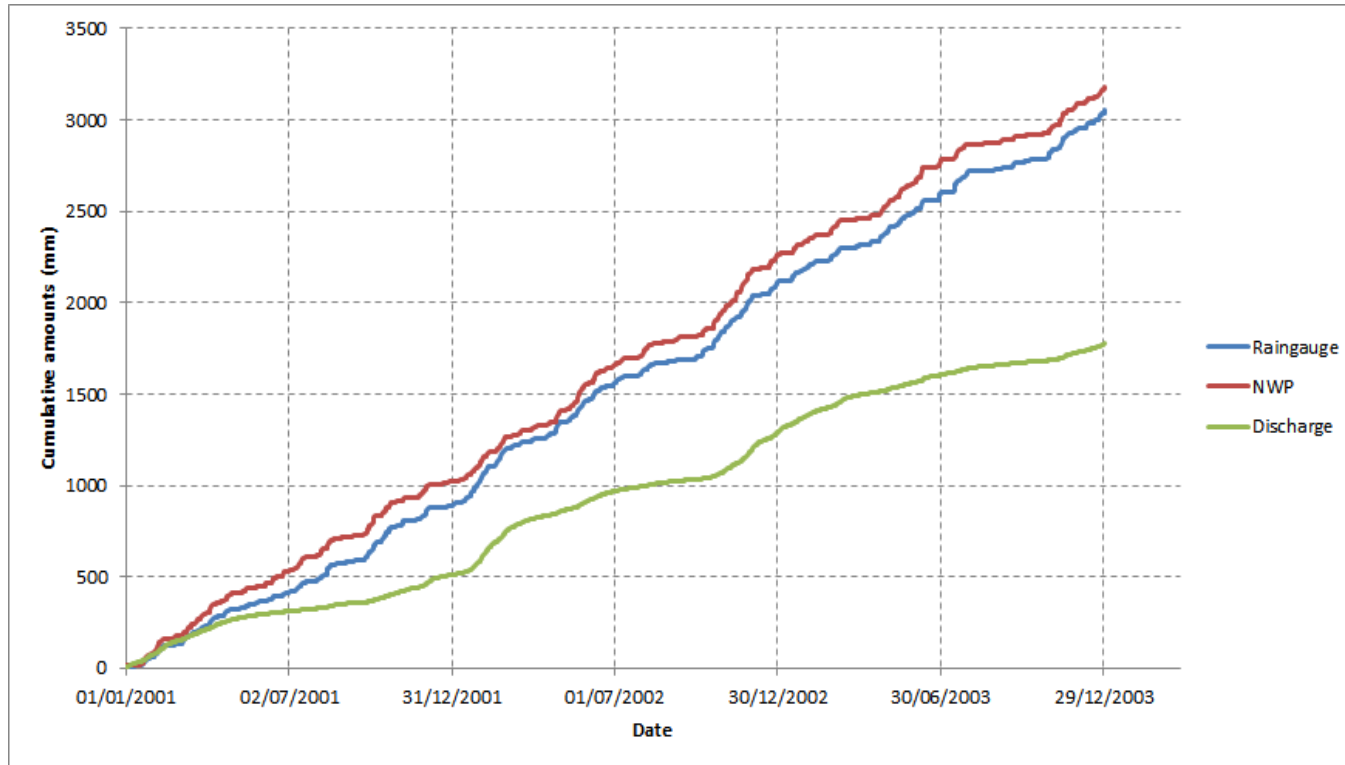
Suir Catchment - raingauges used



Suir Catchment MÉRA grid



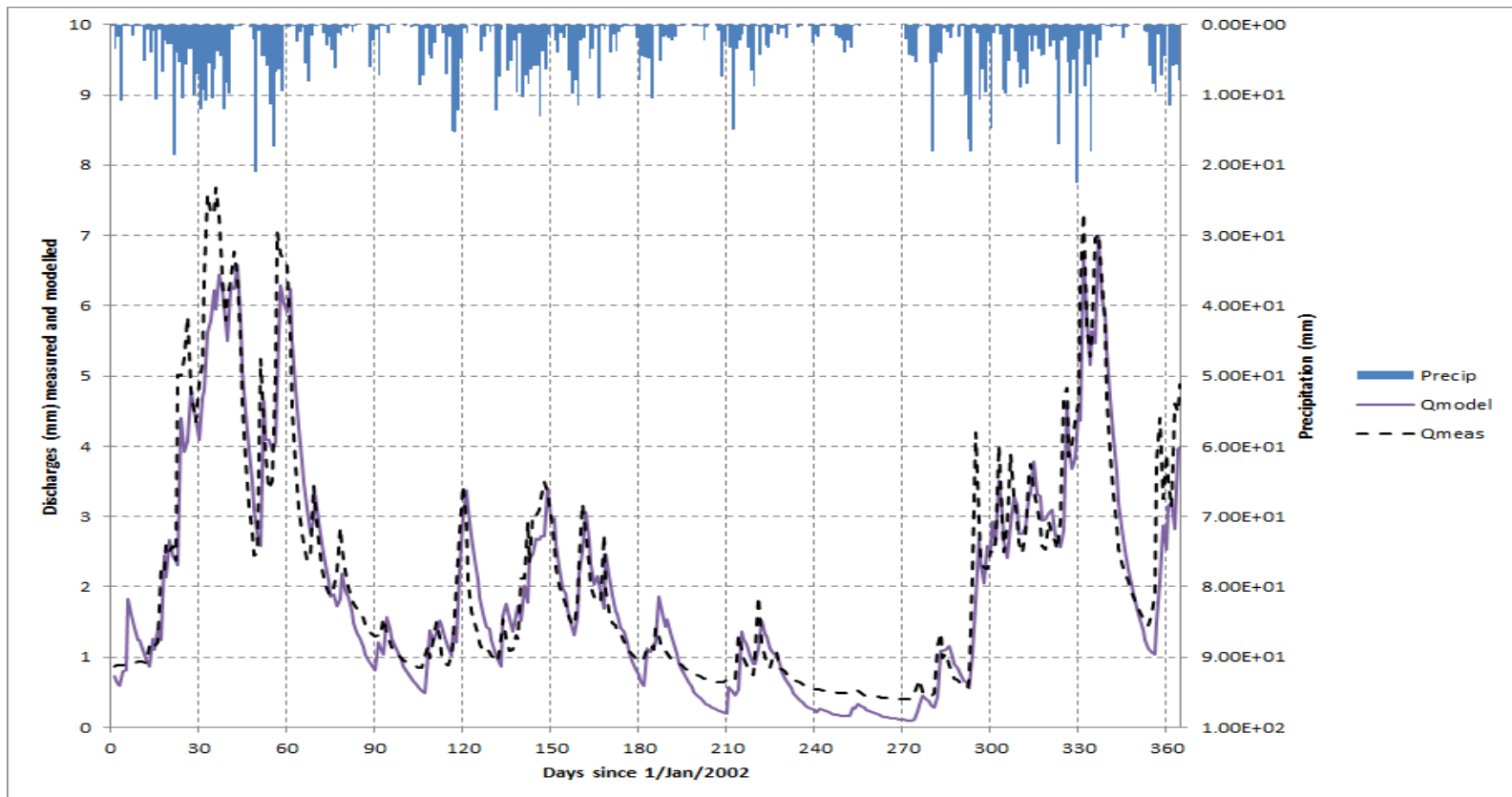
Raw data cumulatives



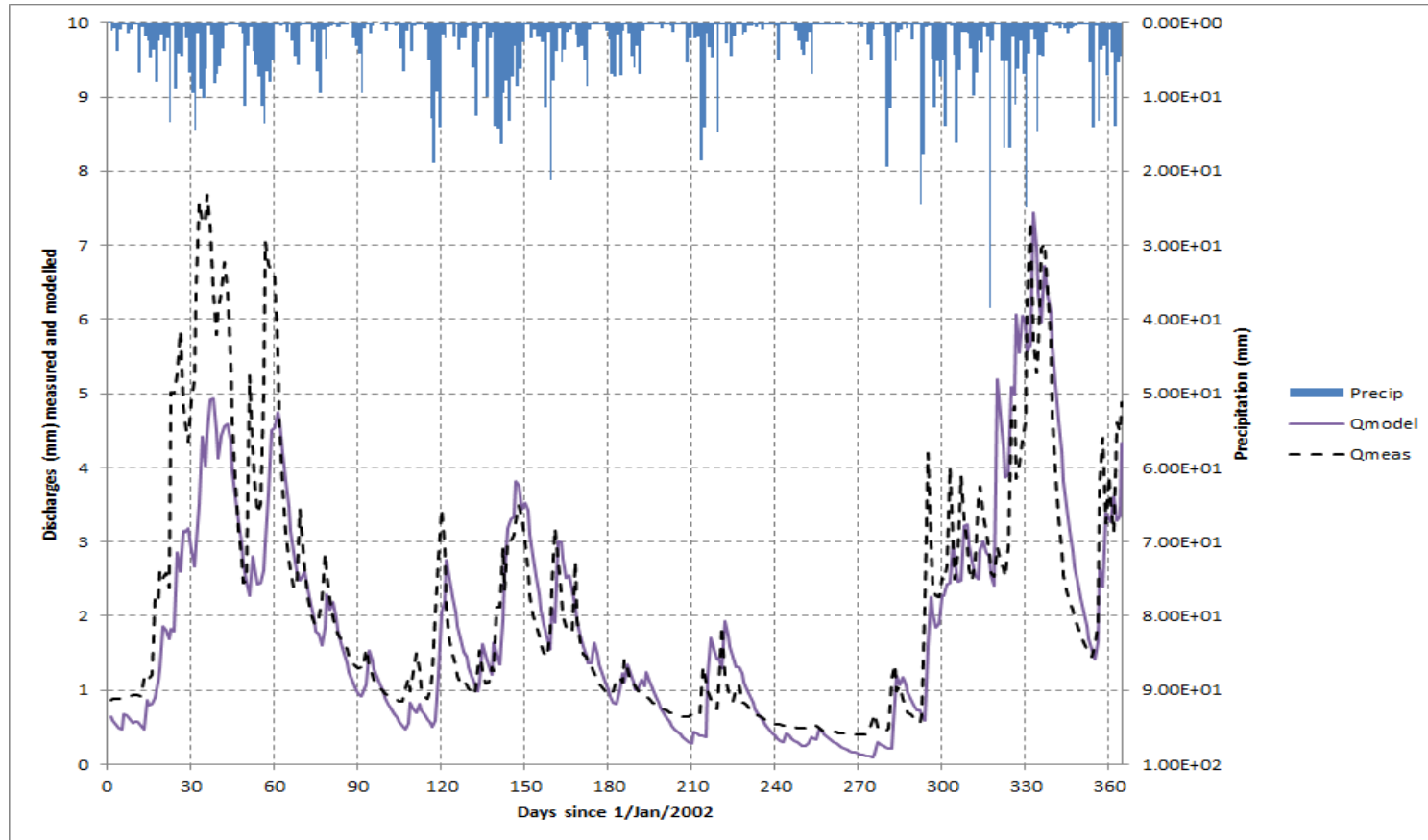
SUIR Performance Summary (2001-2003)

Suir (daily time step)	Source of precipitation information	
Index	Raingauges	MÉRA
Bias (mm)	-0.083	-0.069
Mean Abs Residual (mm)	0.37	0.48
Root mean square residual (mm)	0.54	0.73
Nash-Sutcliffe criterion	0.83	0.69

Suir simulation with raingauges 2002



Suir simulation with MÉRA 2003



Conclusions

1. Despite the poor modern coverage of some of these catchments with raingauges, these performed better at rainfall-runoff simulation. This strongly supports the value of the Met Éireann's rain-gauge network and, considering the reduced number of operational gauges is an argument for increasing coverage in areas for which flood forecasts are required.
2. MÉRA and radar performed well for the larger catchments (with daily time steps) for which their superior spatial coverage is an advantage.
3. The lumped catchment model approach seems to work well for flood forecasting in the larger catchments (areas of thousands of km²).
4. Smaller, steeper, flashy catchments are more challenging for flood modelling, even when the model time steps are reduced to hourly.

Acknowledgements

The material presented was mainly from the EPA funded FloodWarnTech project (2014-W-DS-17) and some subsequent work with a fuller MERA dataset.

For more details of the SMART catchment model see

Mockler, E., O'Loughlin, F. & Bruen, M. (2016) Understanding hydrological flow paths in conceptual catchment models using uncertainty and sensitivity analysis. *Computers and Geosciences*, 90B:66-77