



Onibon H., et al., 2004.

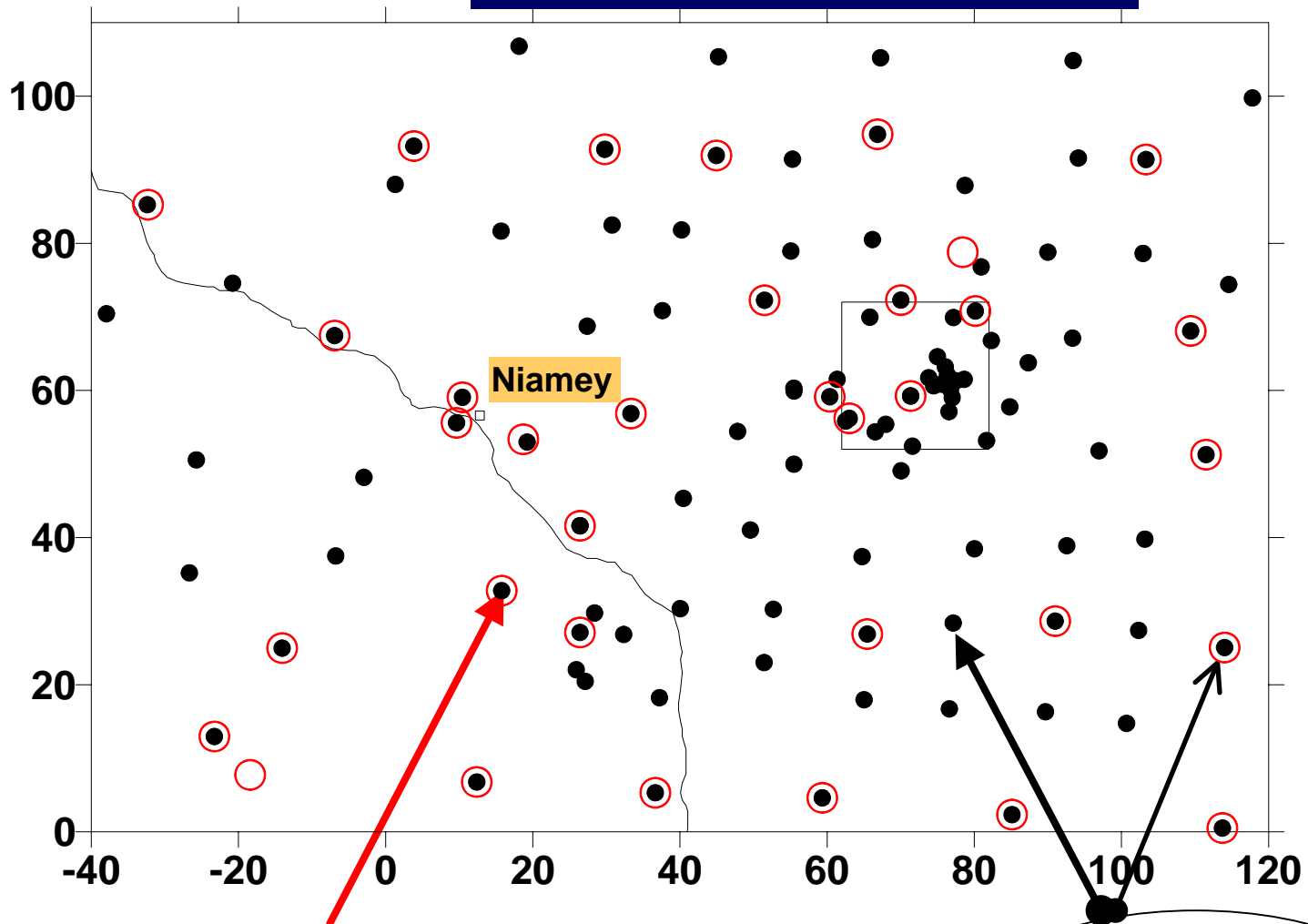
Gibbs sampling for conditional spatial disaggregation of rain fields

Water Resources Research, 40, W08401, doi: 10.1029.

Why developing such models ?

Niamey Mesoscale site

16 years of high time resolution rain data



1994-2005-
34 stations

1990-1993
107 Stations

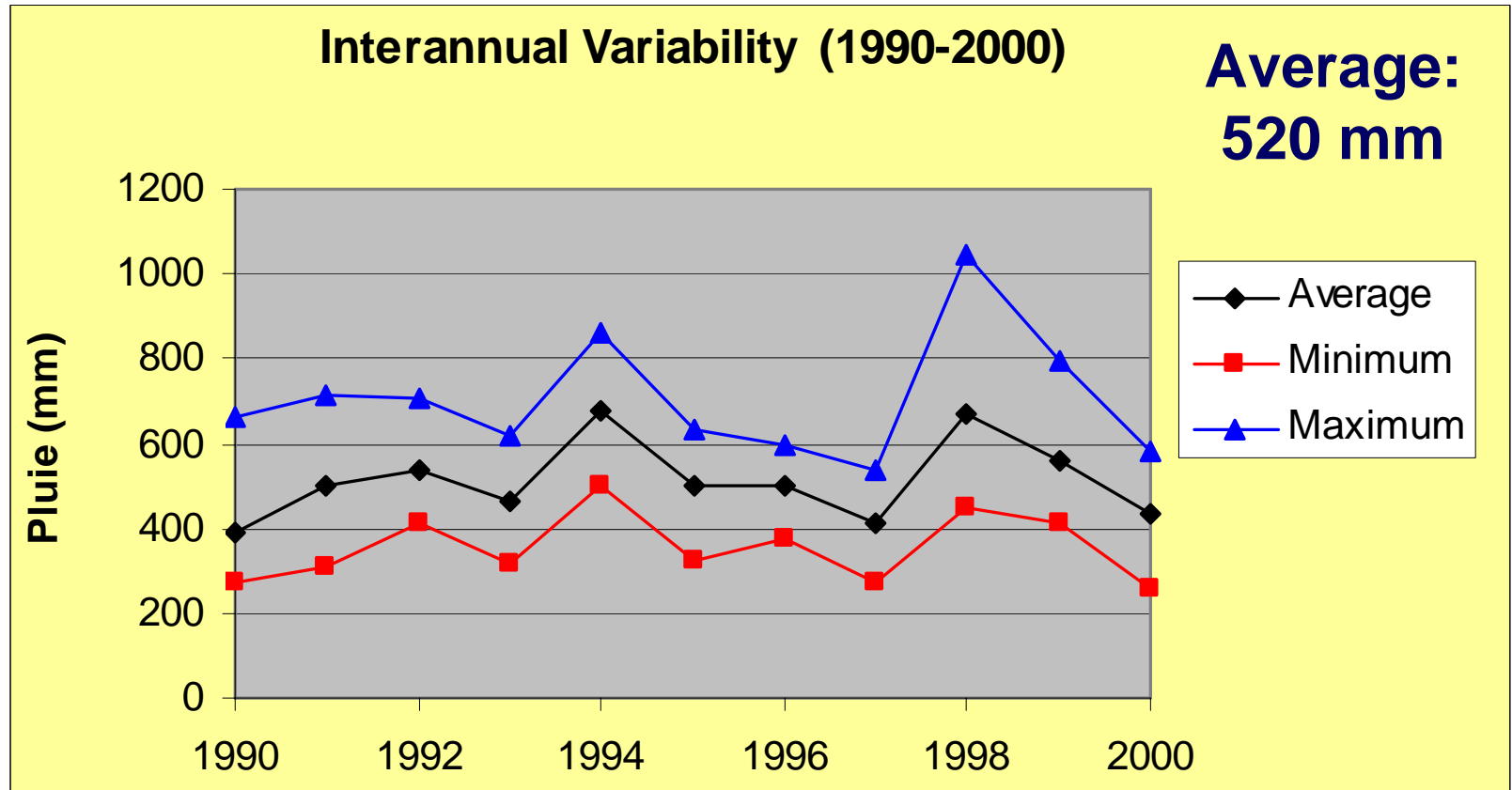
EPSAT-Niger (1990-2000)

Average climatic conditions

Deficit: 40 mm (with respect to 1950-1990)

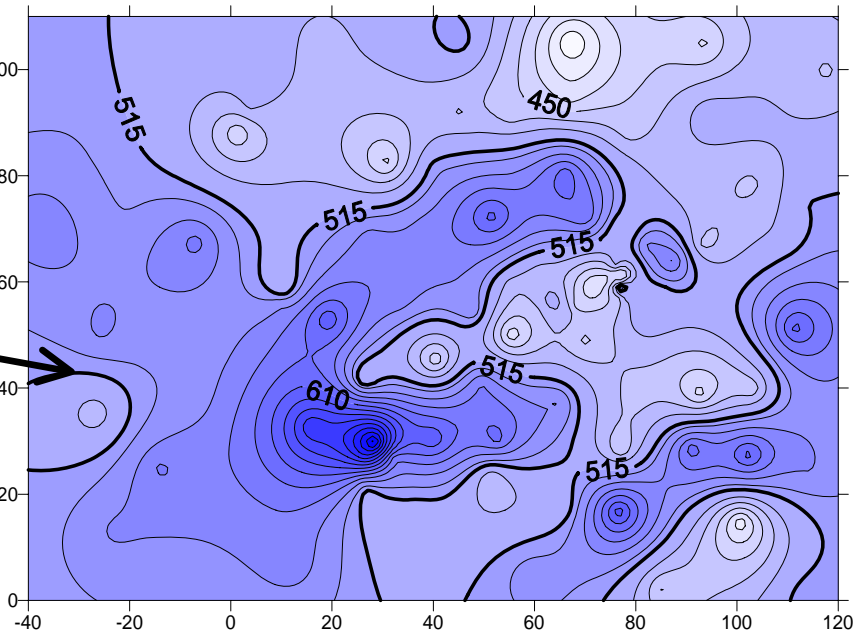
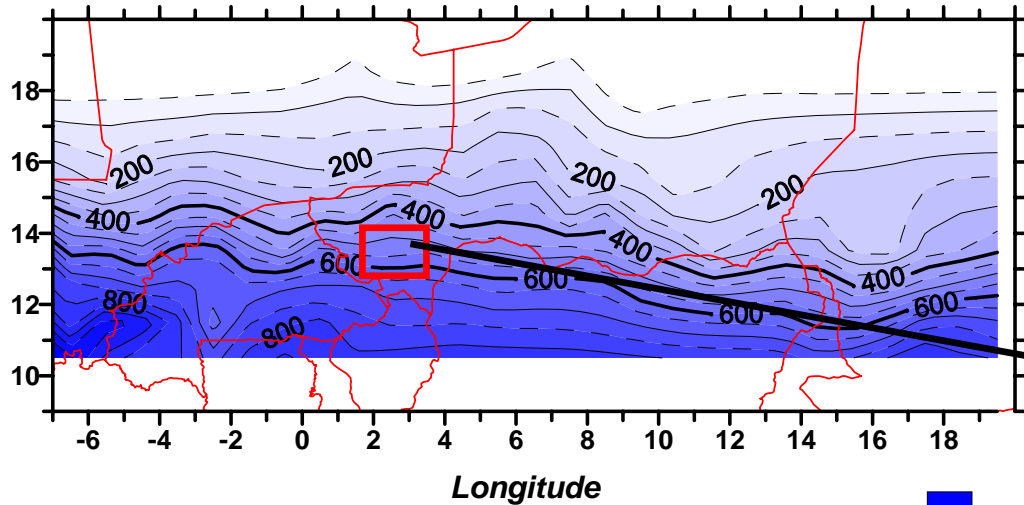
Maximum: 663 mm (station: 1044 mm)

Minimum: 417 mm (station: 255 mm)

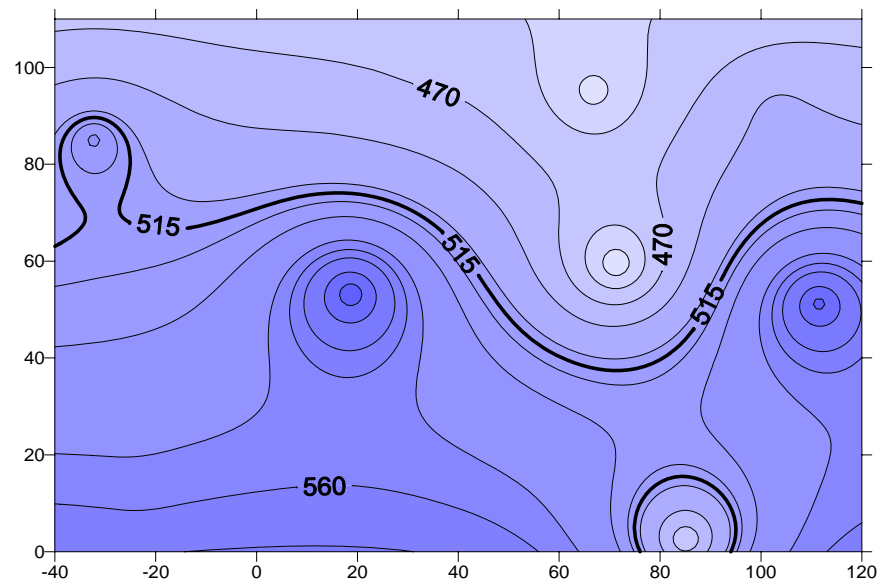


Rainy season 1992 (mm)

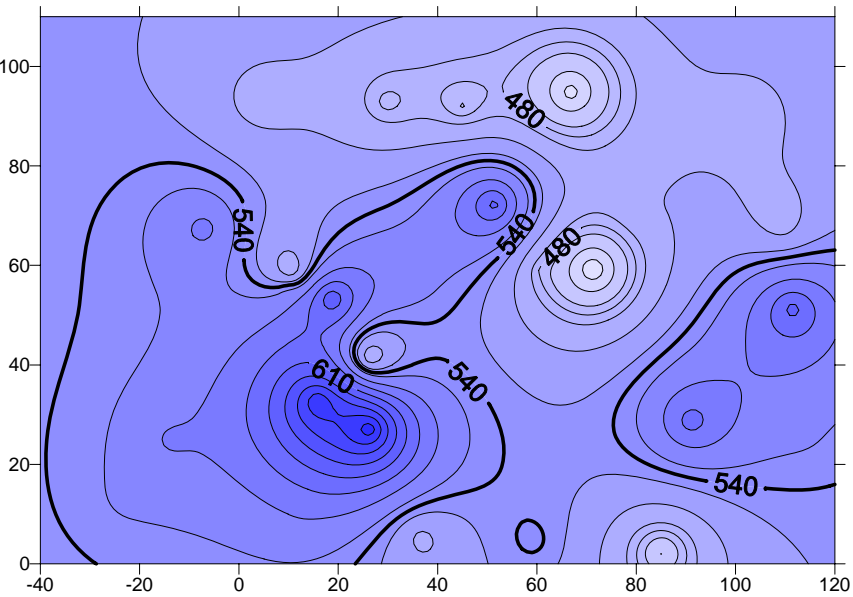
109 stations
Average= 513 mm



11 stations
Average= 515 mm

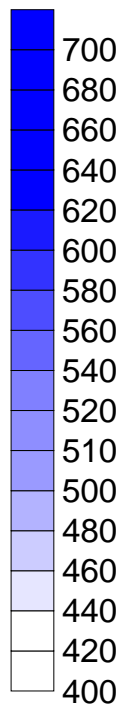


30 stations
Average= 537 mm

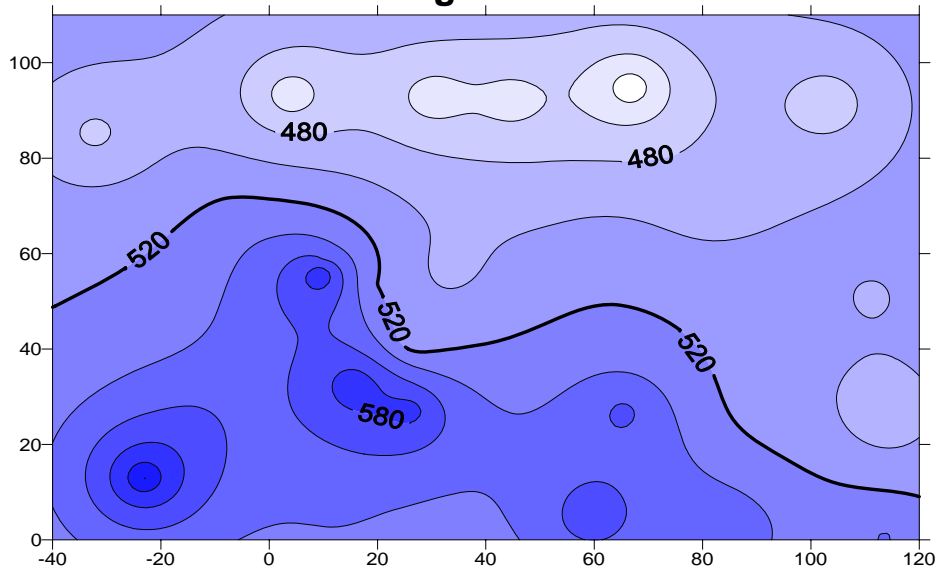


EPSAT-Niger / CATCH Long term measurements

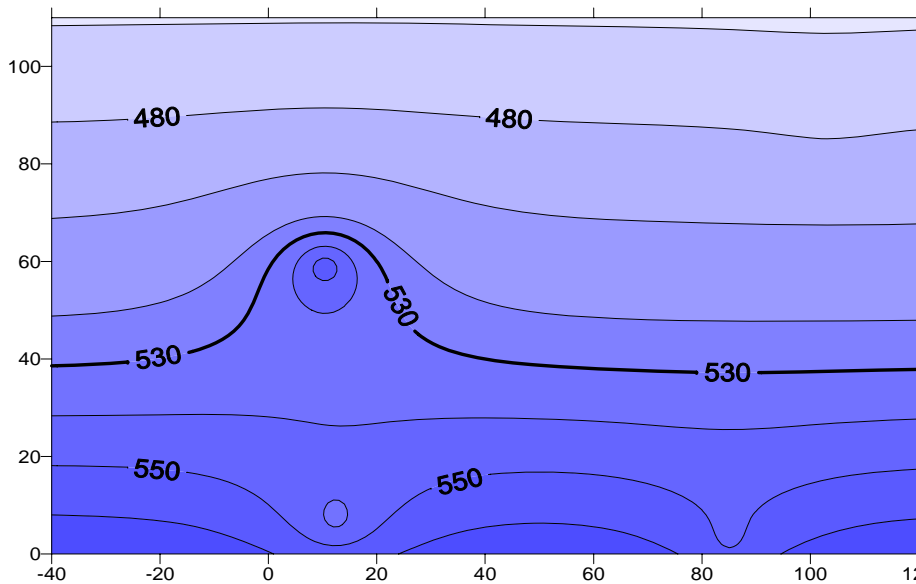
Average 1990 - 2000



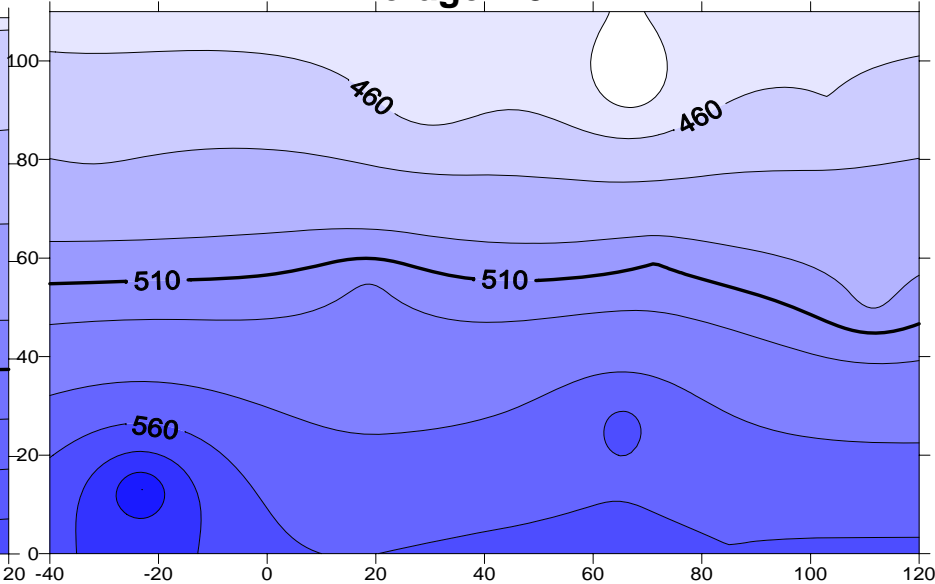
30 stations
Average= 519 mm



4 stations
Average= 531 mm

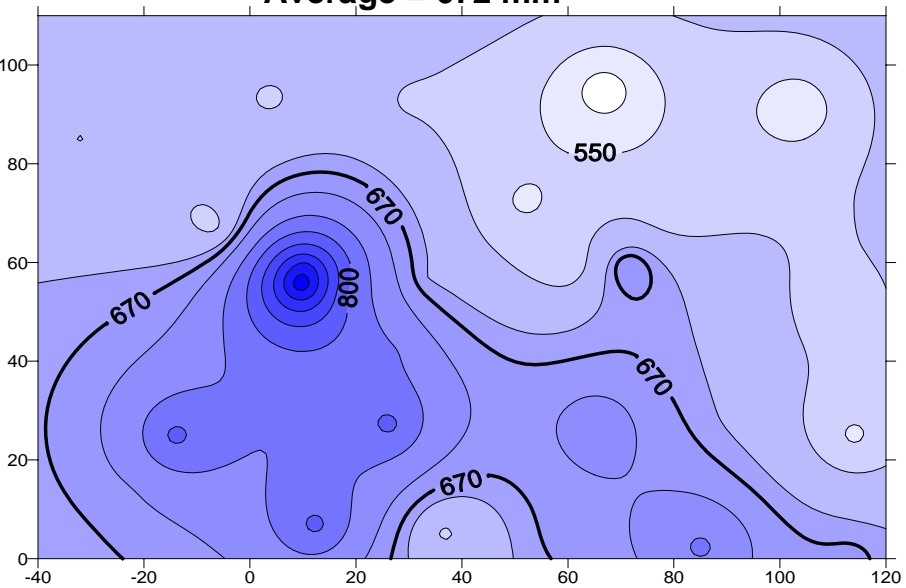


11 stations
Average= 511 mm

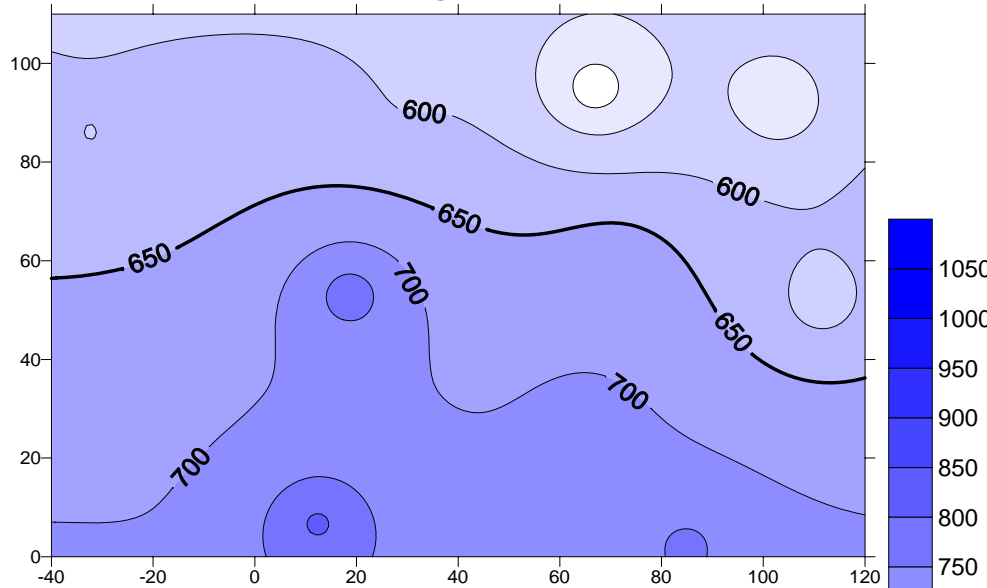


Rainy season 1998 (mm)

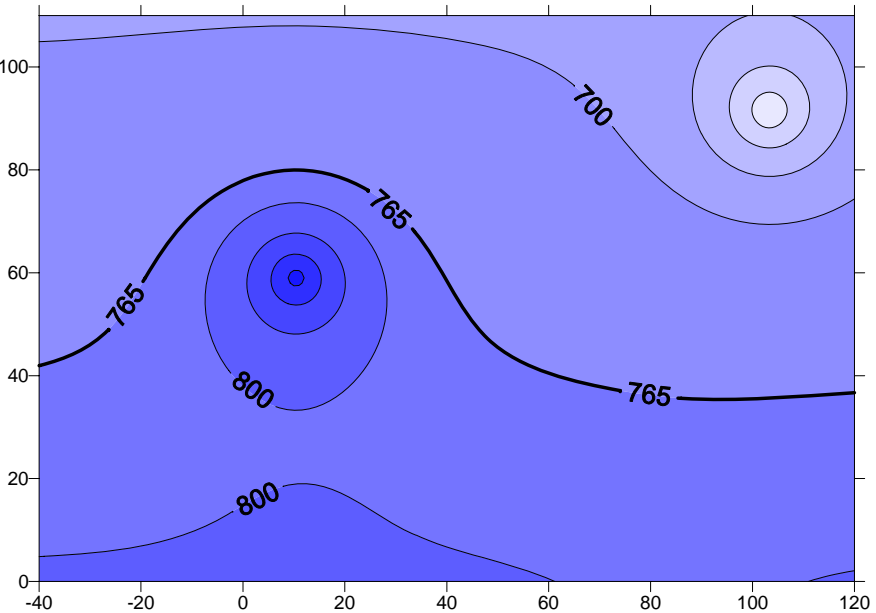
30 stations
Average = 672 mm



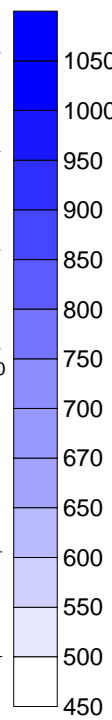
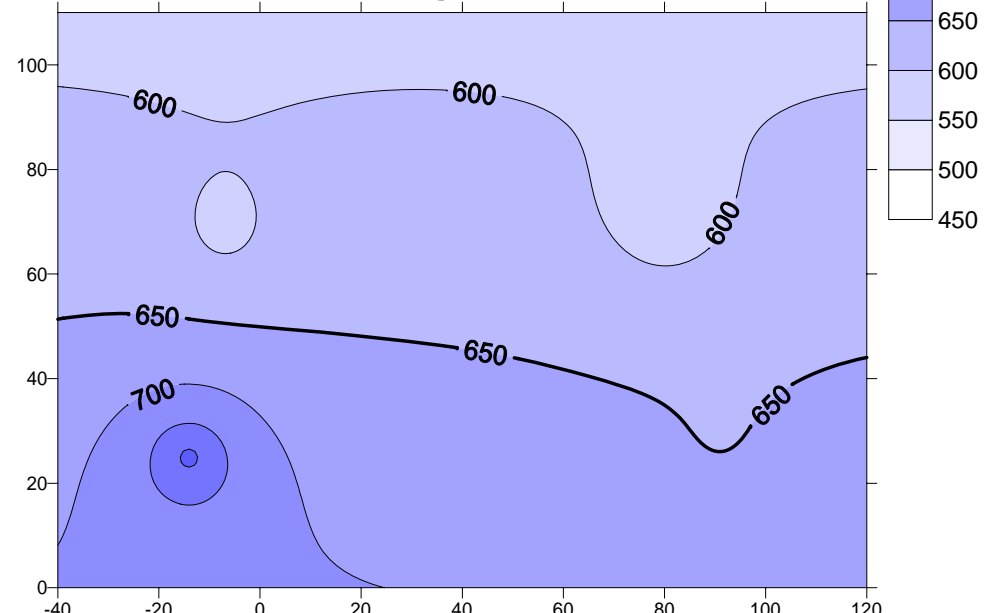
11 stations
Average = 655 mm



4 stations
Average = 765 mm



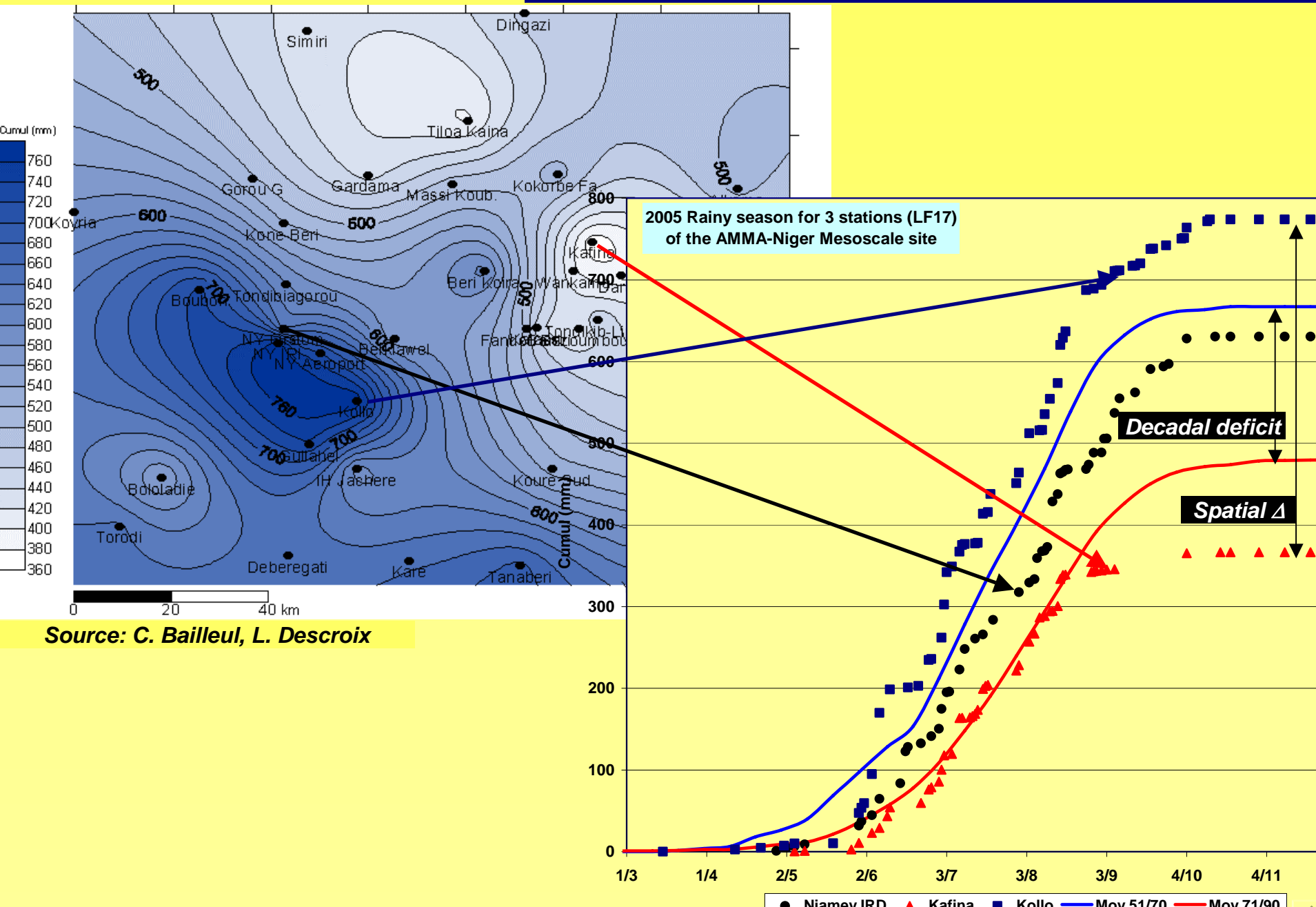
4 stations
Average = 649 mm



Implications

- This high rainfall variability has three main implications:
 - 1) Climate and diagnostic studies: at which scale should we characterise the quality of the rainy season (space averaging and resolution).
 - 2) Water Cycle studies: what is the impact of this small scale space variability on the assessment of the water balance from the meso to the regional scale ?
 - 3) Operational hydrology: are the current rainfall observing systems of sufficient resolution; how can they be upgraded or complemented by other sensors ?

2005 Rainy Season, Niger meso site

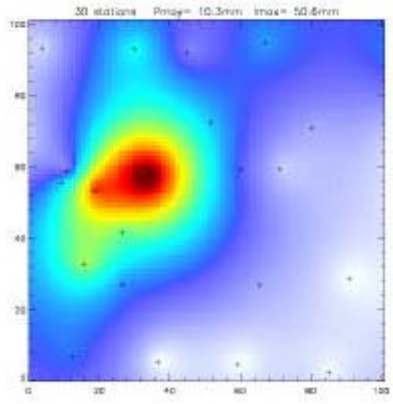


Impact of the small scale variability on the assessment of runoff

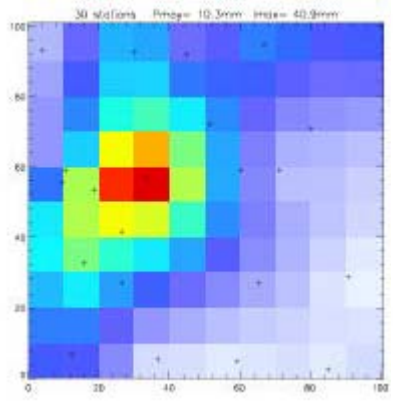
\bar{P} spatial

Rainfall

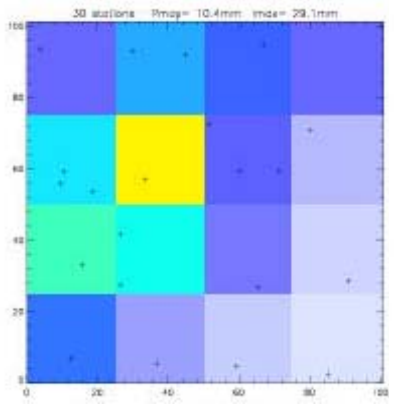
14.4 mm



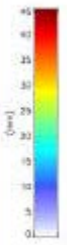
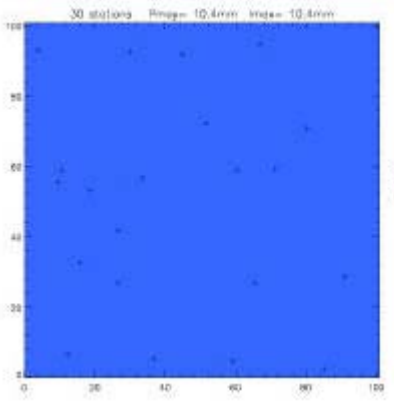
14.4 mm



14.4 mm



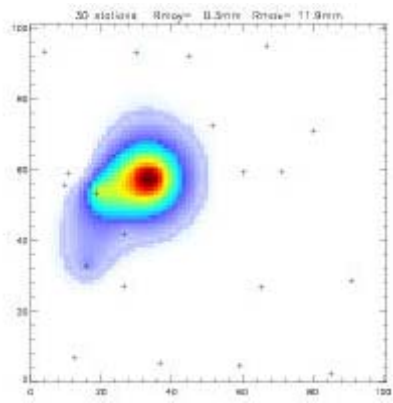
14.4 mm



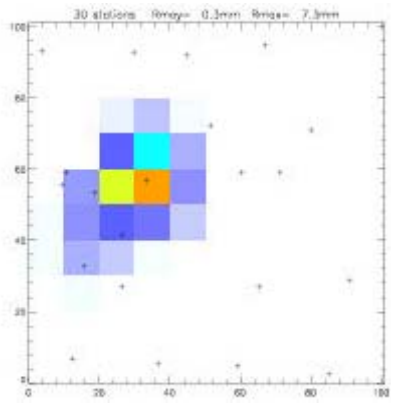
\bar{Lr} spatial

Runoff

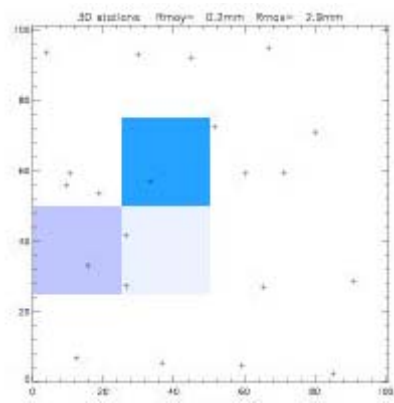
0.3 mm



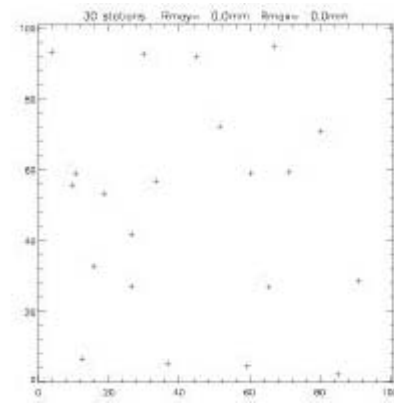
0.3 mm



0.2 mm

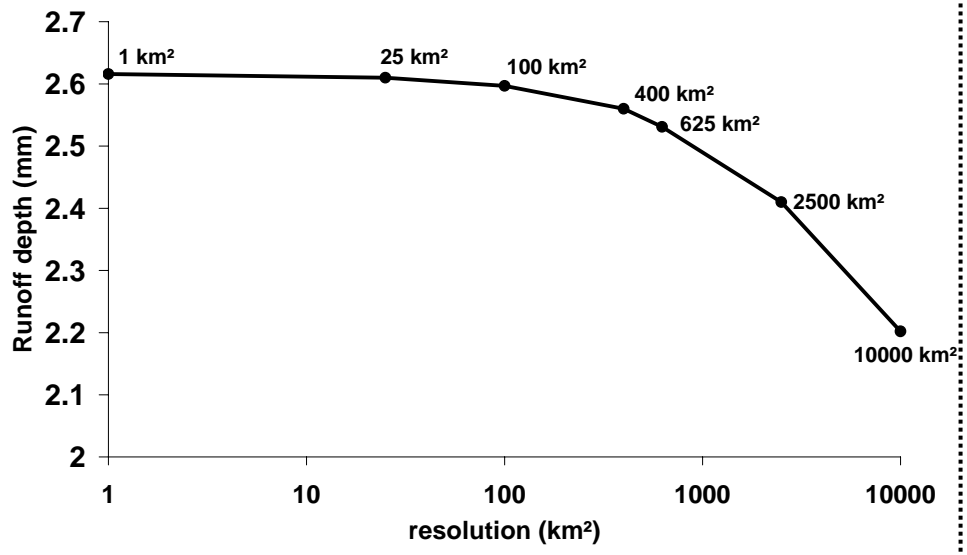


0 mm

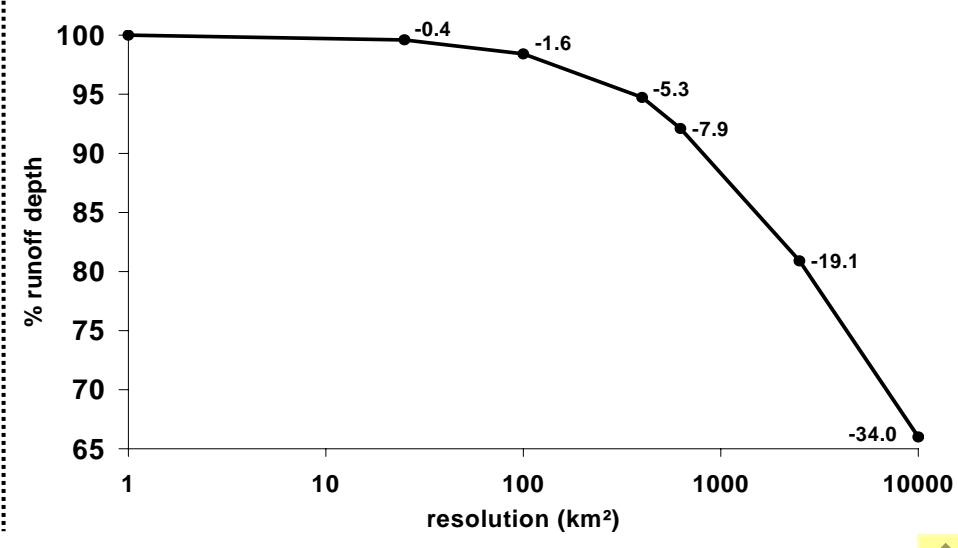
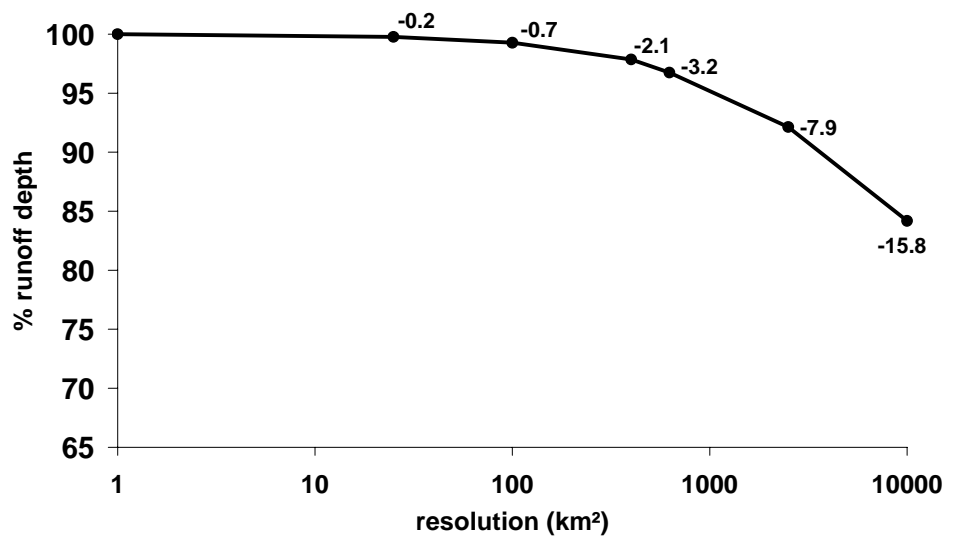
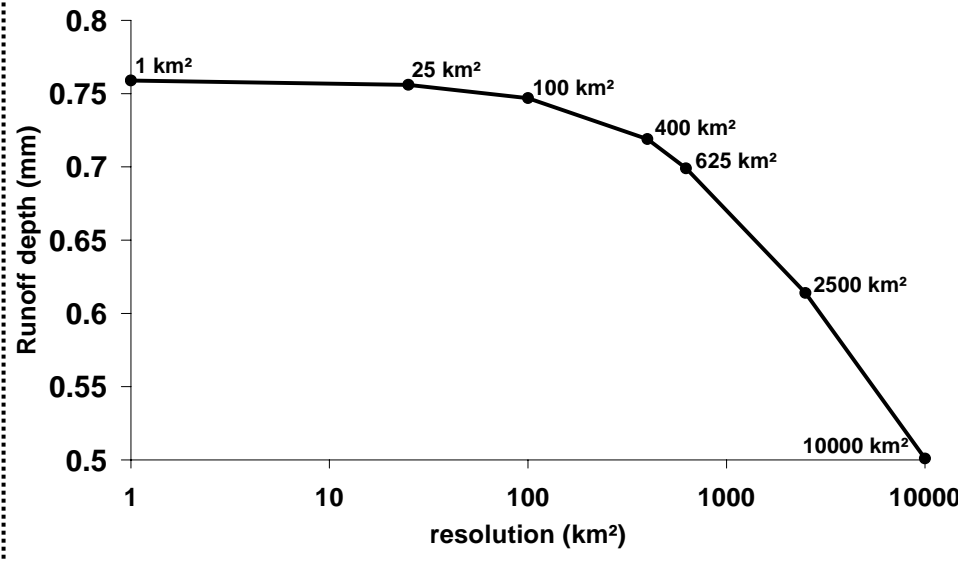


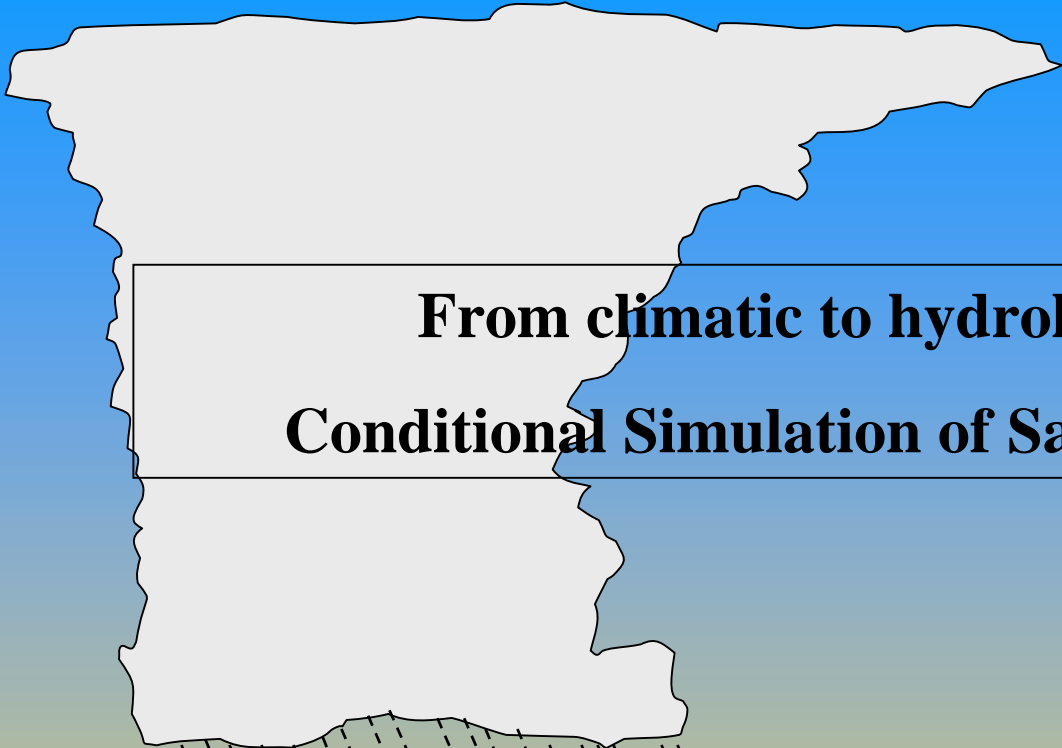
Average over 546 rain events (1990 – 2002)

Catchment 2, medium runoff coefficient

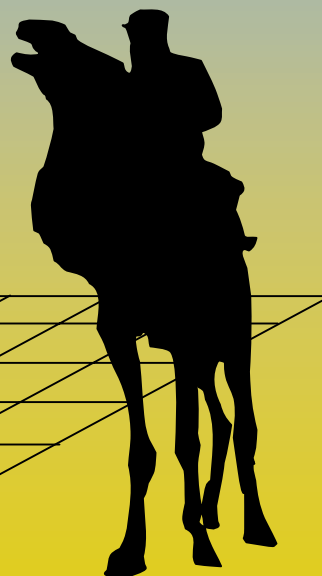
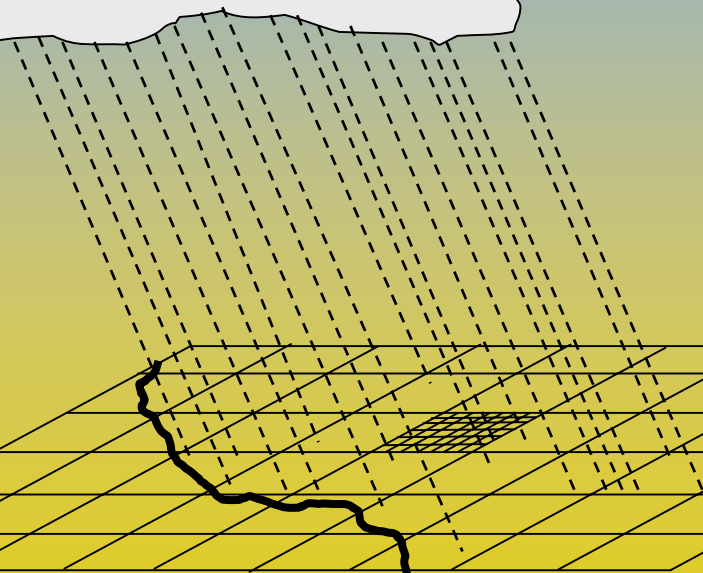


Wankama, low runoff coefficient



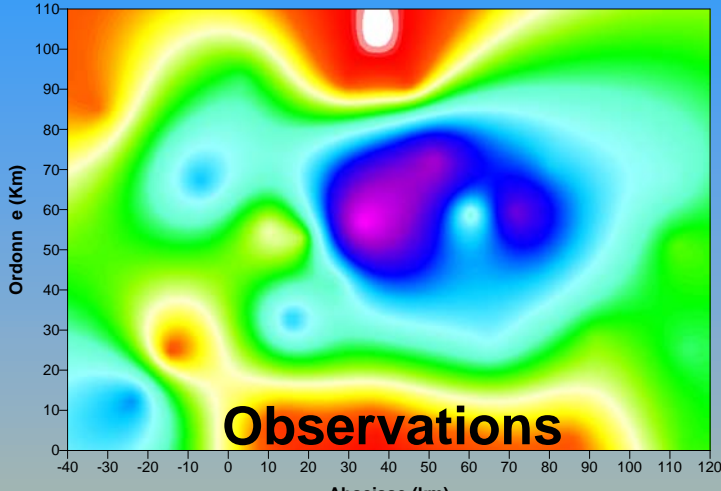
A white outline map of the African continent is positioned in the upper left quadrant of the slide. A rectangular box with a black border is superimposed over the map, containing the title text.

From climatic to hydrological scales
Conditional Simulation of Sahelian Rainfields

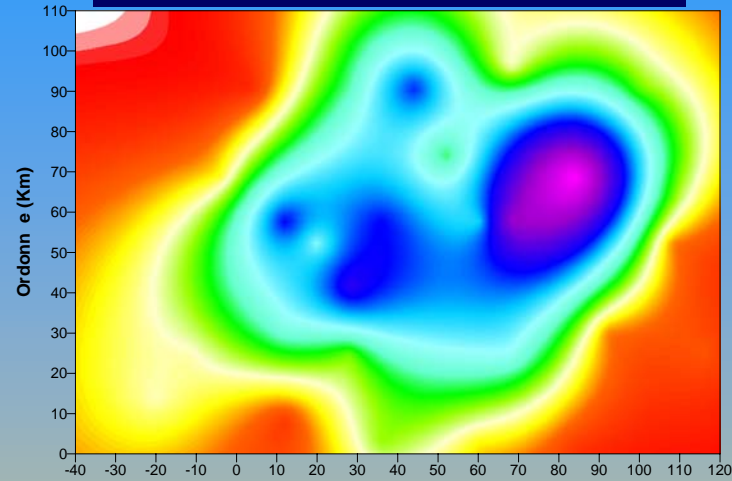


Example of a simulation on one rain event: the areal rainfall is conserved

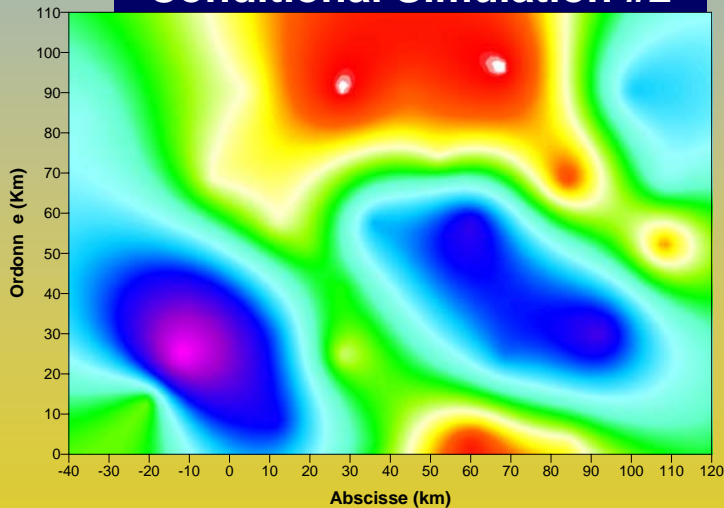
Événement du 12/07/90 (Observations)



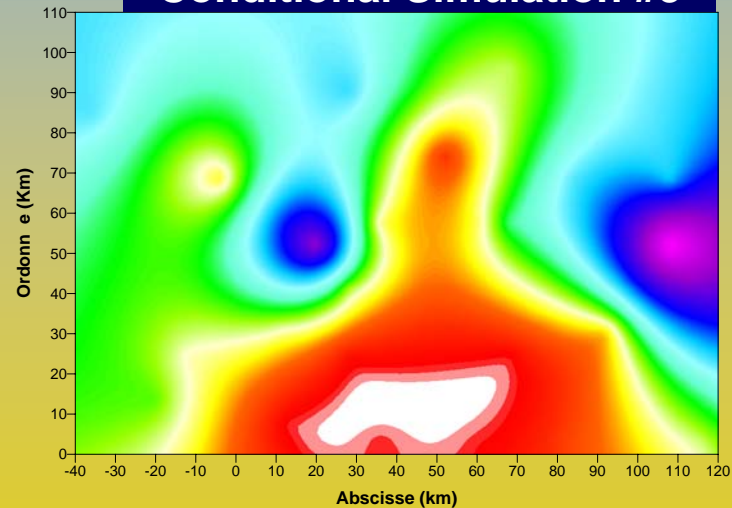
Conditional Simulation #1



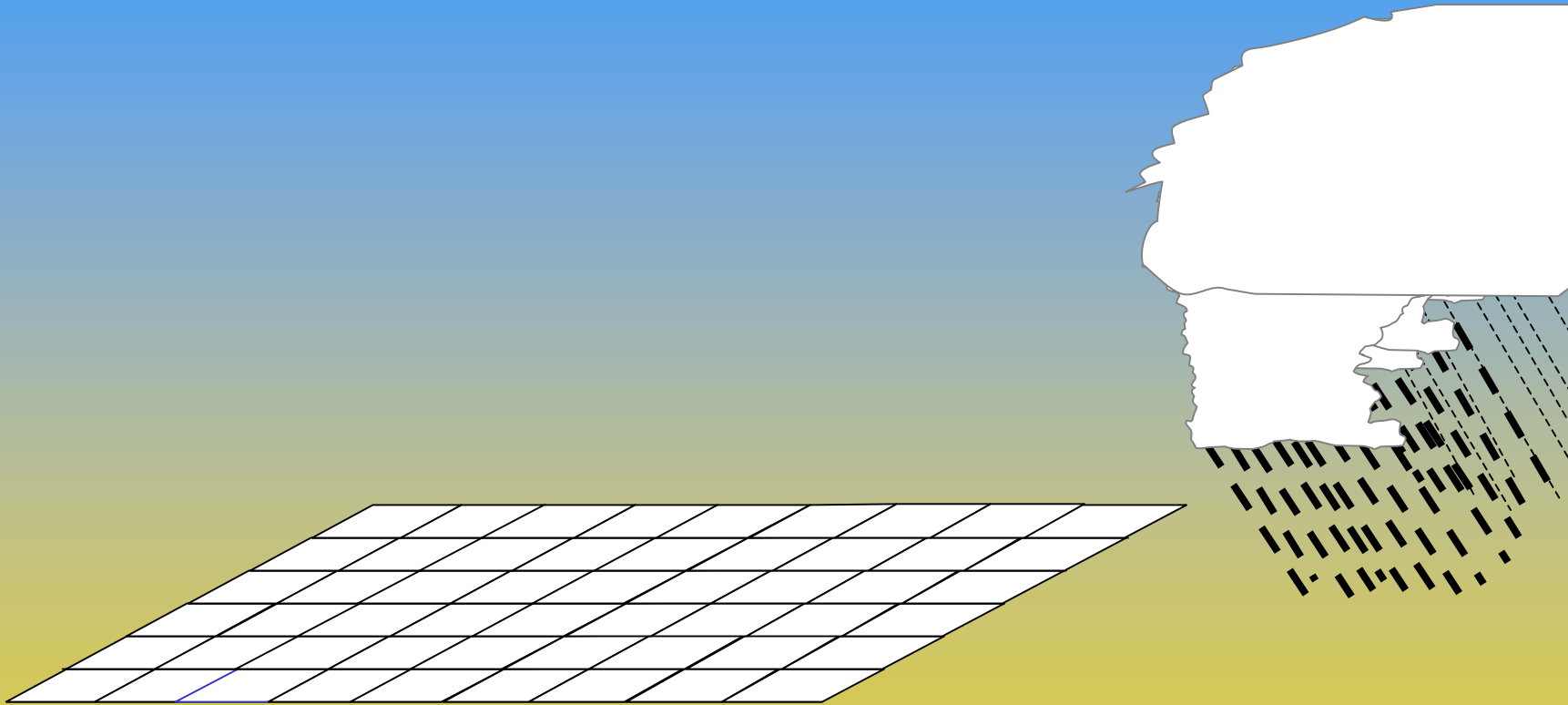
Conditional Simulation #2



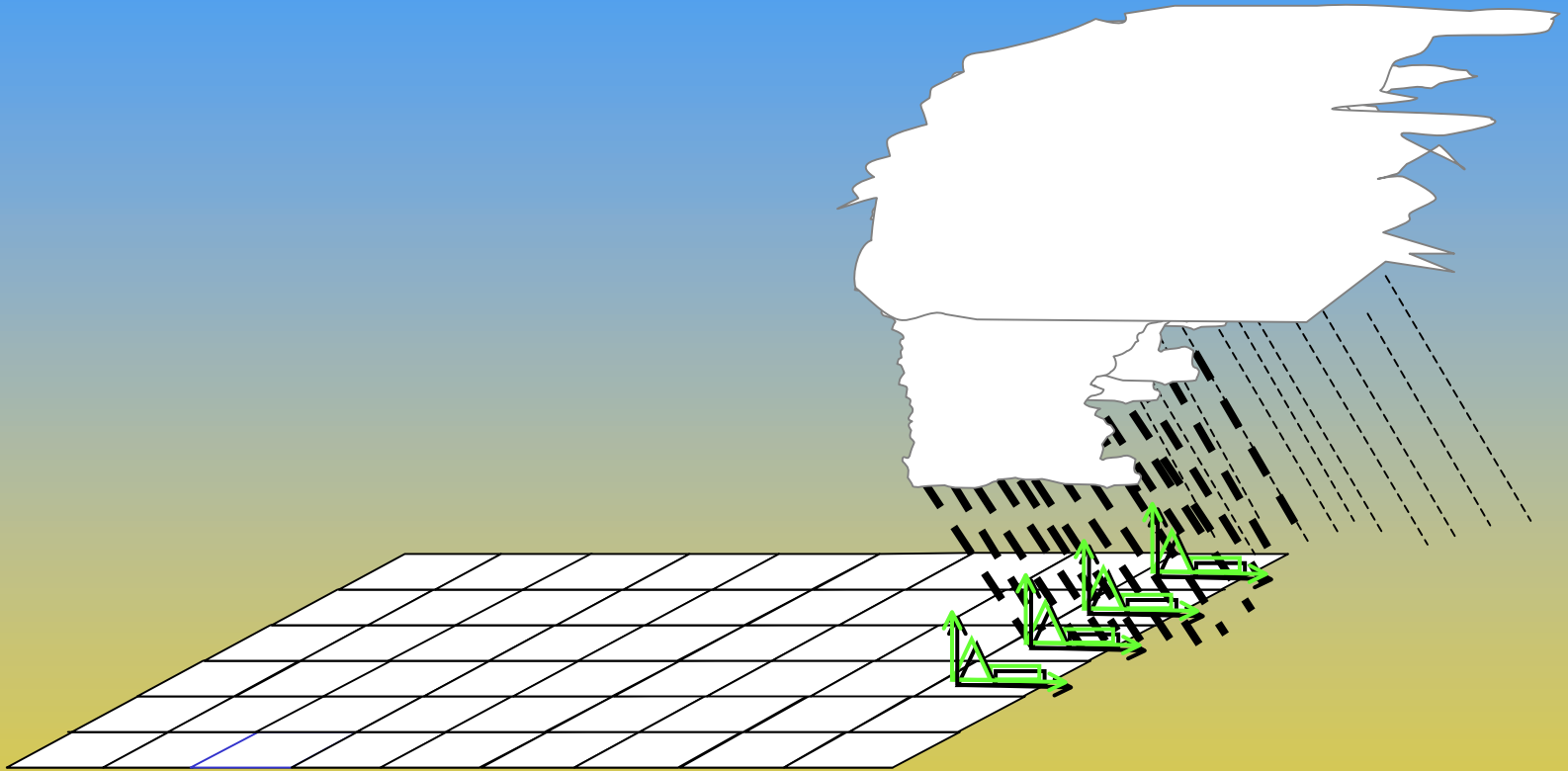
Conditional Simulation #3



Space-Time disaggregation



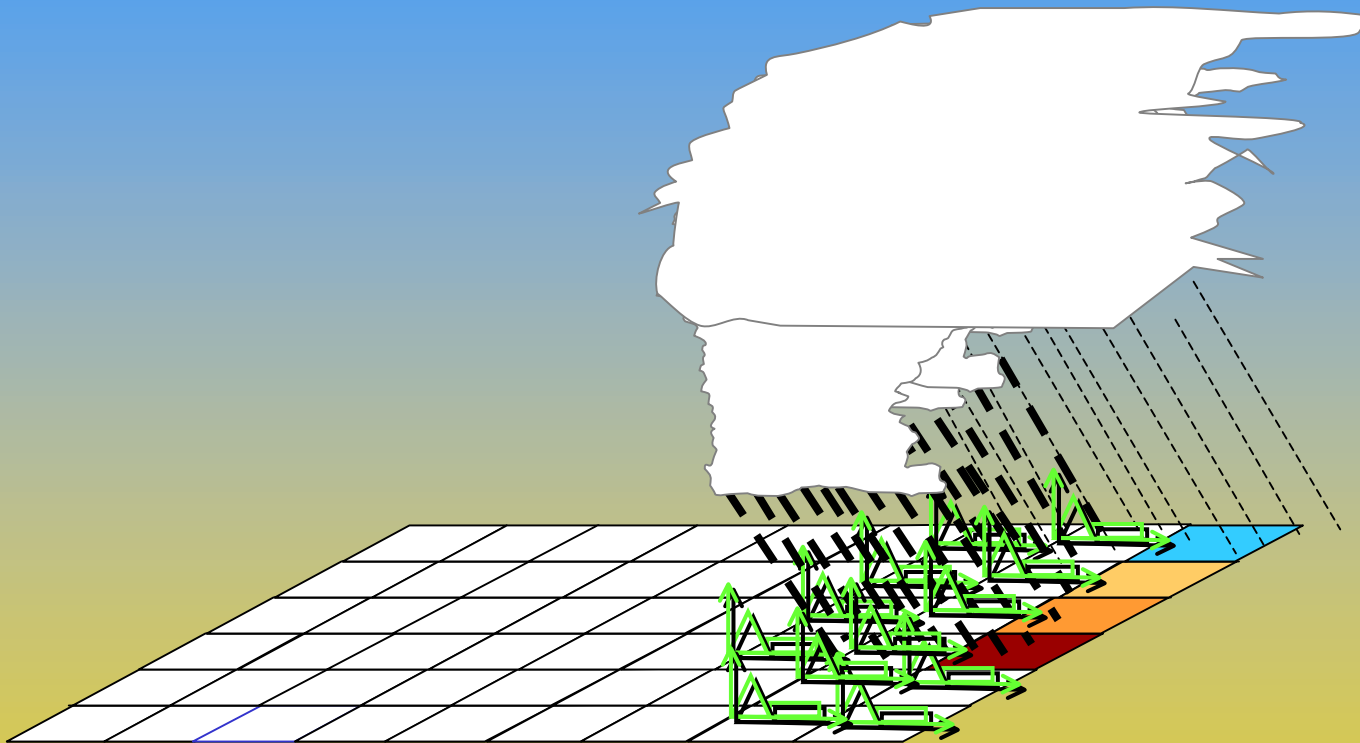
Space-Time disaggregation



$t = 20 \text{ min}$



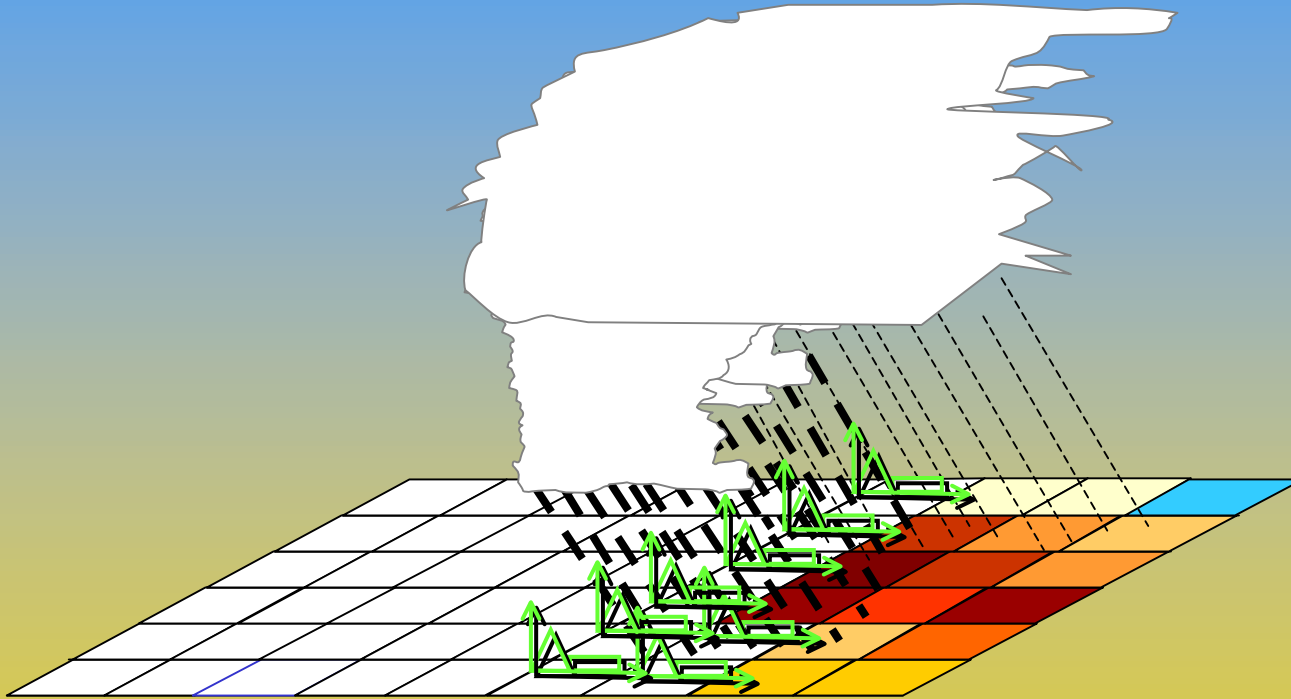
Space-Time desaggregation



$t = 40 \text{ min}$



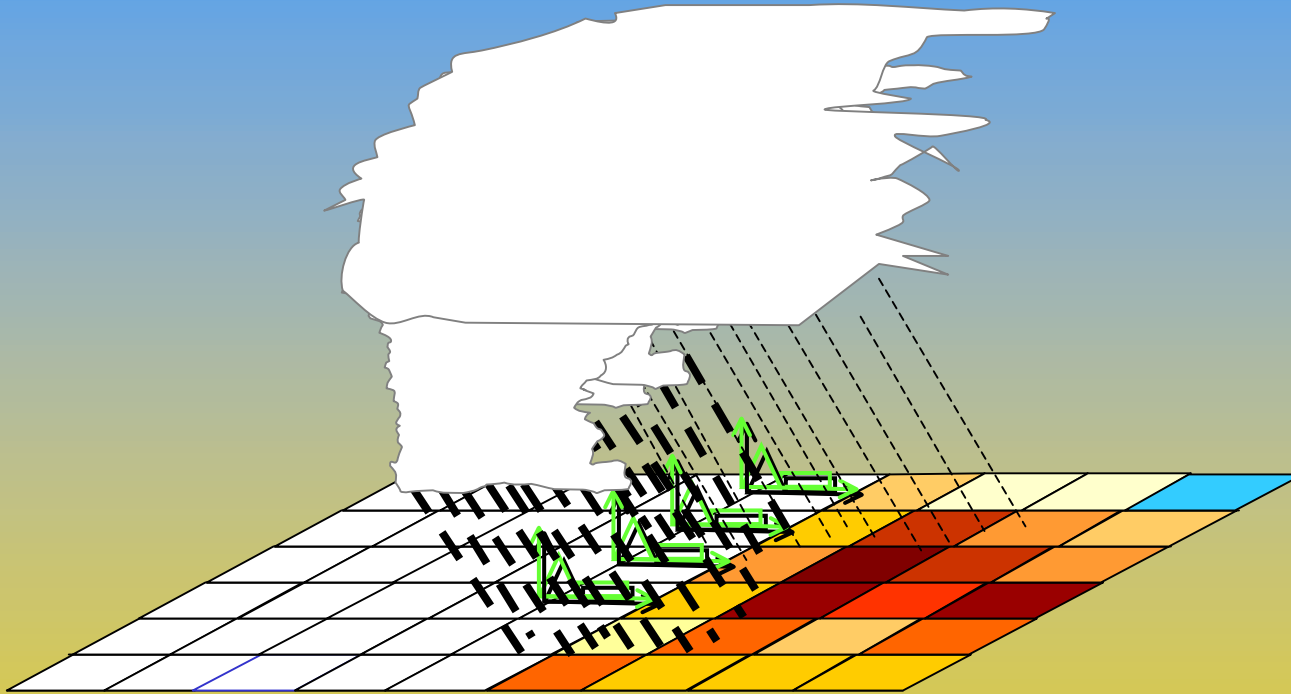
Space-Time desaggregation



$t = 60 \text{ min}$



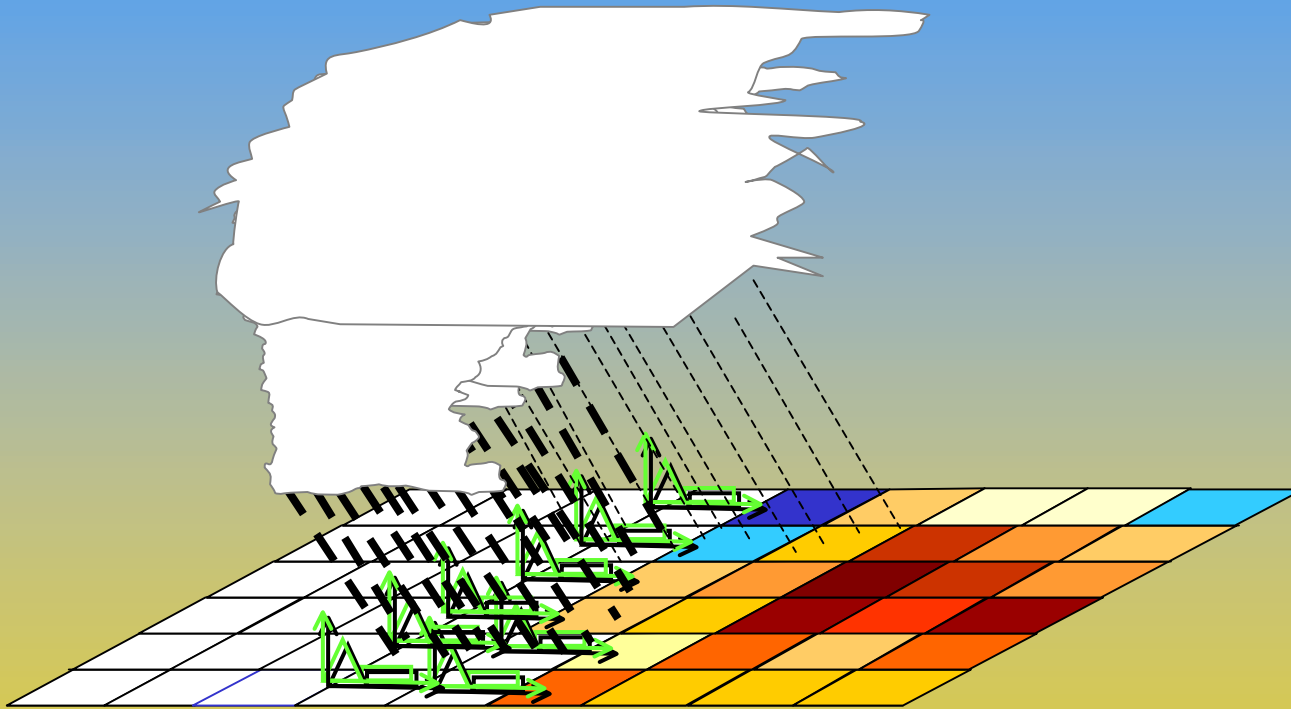
Space-Time disaggregation



$t = 80 \text{ min}$



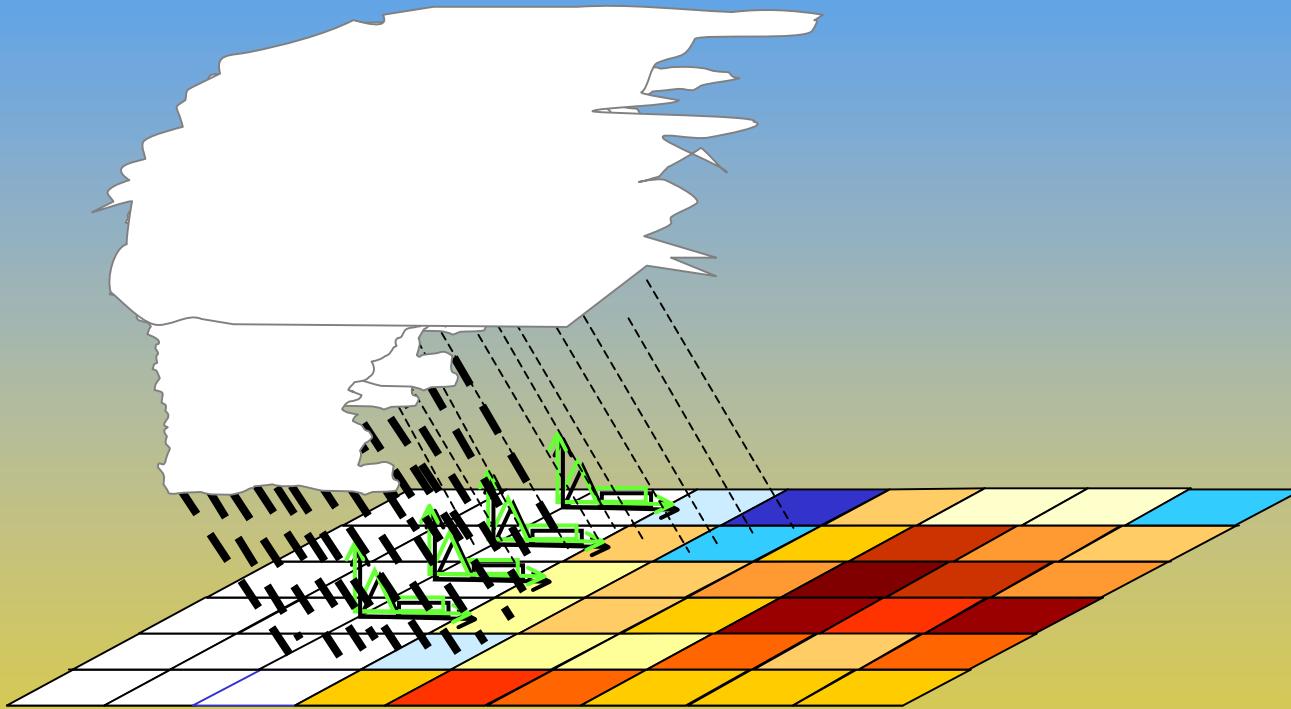
Space-Time disaggregation



$t = 100 \text{ min}$



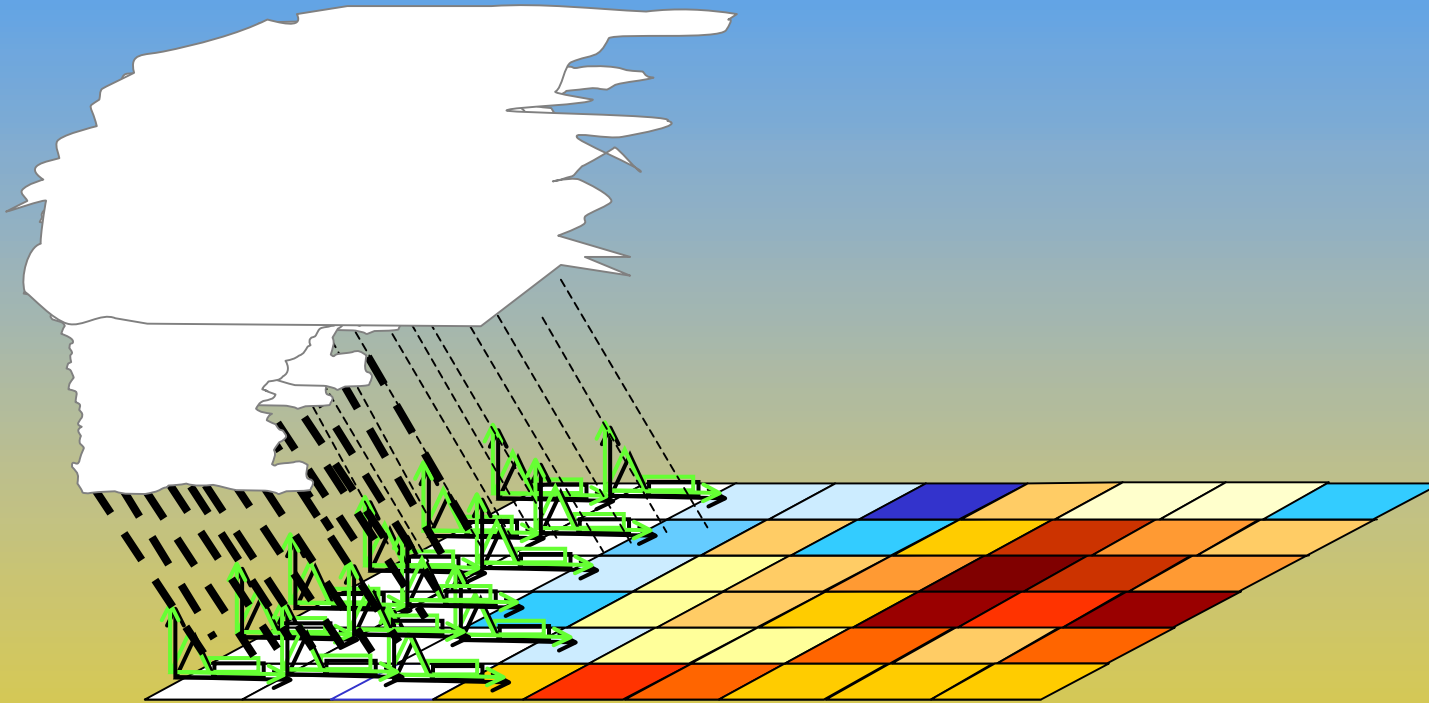
Space-Time disaggregation



$t = 120 \text{ min}$



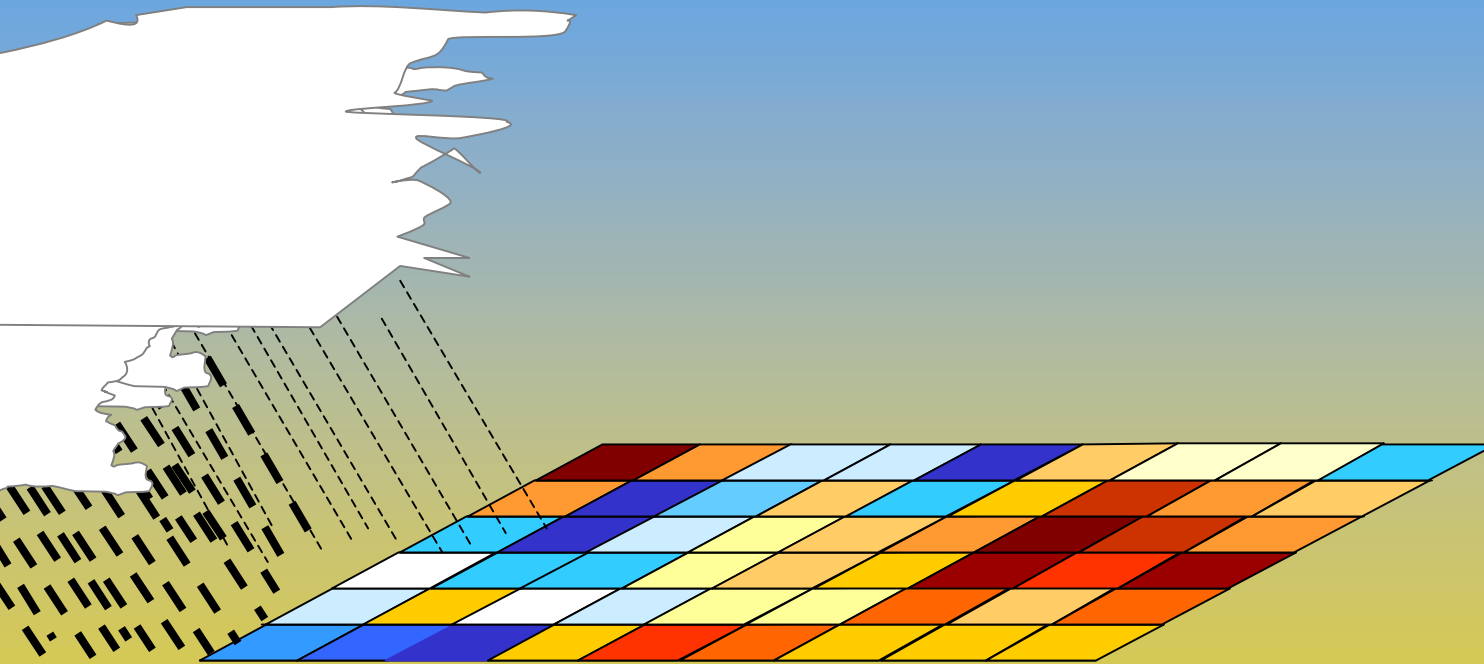
Space-Time desaggregation



$t = 140 \text{ min}$



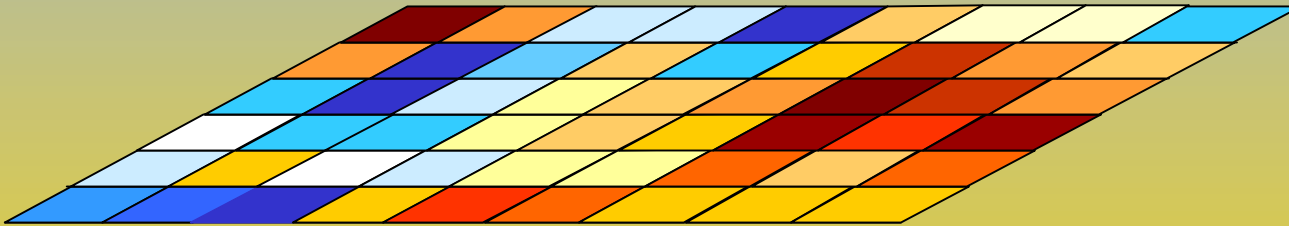
Space-Time disaggregation



$t = 160 \text{ min}$



Space-Time disaggregation





See you in the field