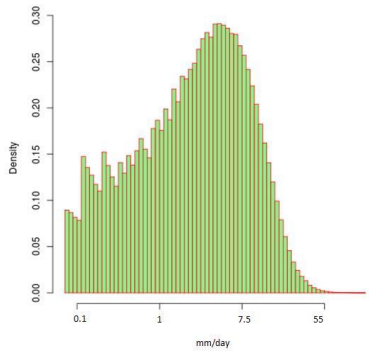
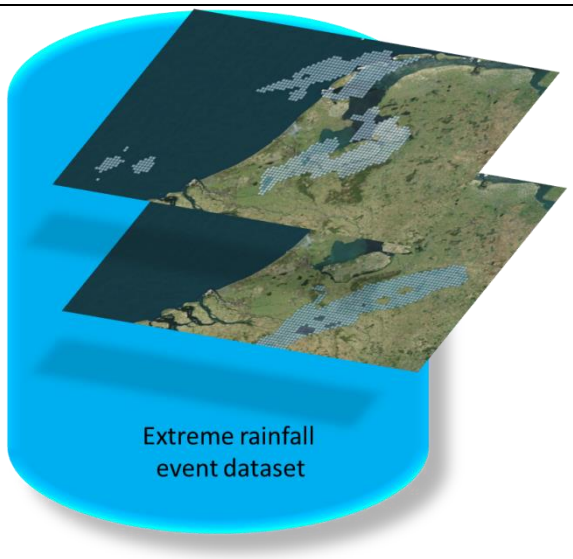
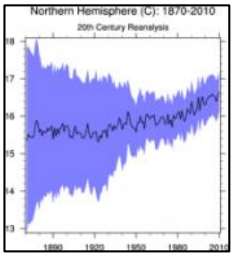
Document title	**OASIS-rain product description**
What kind of event database ?	• An event dataset of extreme rainfalls: provided is a dataset constituted of "synthetical events", being realistic physical simulations of event scenarios in current climate conditions. Can complete a historical set of real events, for risk assessment purpose.
Where ?	• The whole country of Netherlands is covered by the existing database. • Other regions of the world of variable sizes (from 700km x 700km to 1500km x 1500km) could be covered, with a product based on the same method. • A minimum list of 5 different users over this new region is required before building this new database, together with a 2 months calculation period.
Resolution ? **Format?**	• Events are generated over the rainfall period duration (typically from 1 to 10 days for Netherlands), with hourly resolution. • Spatial resolution is an information of hourly rainfall during the event every 3km x 3km cell of a square grid covering entirely Netherlands. • Each event is provided in ESRI shapefile format, with one column in the attribute table corresponding to the rainfall amounts in all cell grids for one hourly time step of the event (see sample).
Which exact product is provided?	• On-demand extraction of regions of interest inside the full Netherlands event database. The full database amounts to about 70.000 events (variable duration from 1day to 11days), for a total of 5TB. • Extraction sent on USB device within 2weeks. • Price: TBD by ARIA (depending on requested zone)
Which extreme events?	• Rainfall days are considered extreme when at least in one grid cell (observation or simulate scenario) one hourly rainfall intensity belongs to the 1% highest possible values. • This criterion could be selected different following interest of the client. • For Netherlands, we used KNMI gridded composite radar-rain gauge observations over the period 1998-2010: a maximum hourly intensity 27mm/hr was found to correspond to the 1% highest values.
Why synthetical events?	• Using a well-validated Numerical Weather Prediction (NWP) model, the modelled events offer an accurate risk assessment: • 1/ traditional methods often use a database of real historical events, which footprint are "shifted around" to see in a "what-if" mode what could happen for other zones exposed to similar extreme events. In reality, if such event would occur in other zones, it would have physically a different footprint: making use of a numerical weather prediction (NWP) model makes it possible to reproduce the physical realistic footprint in these other zones; • 2/ the number of samples of historical extreme events are rare over a uniform climate period (30 years maximum). Taking the larger number of samples require either to (1) look more in the past, in different 30years climate period or (2) generate synthetical events in the same climate period. Due to climate warming in a 20th century, one 30 year period is not homogeneous with another: frequency and intensity of extreme events vary from one period to the other. This causes a bias in a multi-period database. This is not the case when using a synthetical event generator extrapolating events over the same 30years climate period.

Method detailed	• Consider only the last 20 years to reflect current climate conditions: 1990-2010. • Extrapolate to have "about 1000 years of current weather": use 56 different scenarios of "what could have happened as the weather during the 1990-2010 period". • Inside these "1000years of current weather", select out all the extreme event days over Netherlands to build the final "extreme event database". • Treatment chain is as follows: • 1/ input data 1: "1000years of current weather" at large scale for the whole globe: atmospheric circulation patterns provided by the NOAA20CR dataset, generated from NOAA global weather model. • 2/ input data 2: use the composite radar-rain gauge observations to establish criteria to define "extreme events" from normal rainfall events. • 3/ tool 1: a screening model allowing to select out inside the 1000year database, the days favourable for extreme rainfalls over Netherlands; • 4/ tool 2: an NWP model, run only over the "favourable days", allowing to calculate the precise weather (hourly and 3kmx3km resolution) • 5/ tool 3: sorting out the simulated days being extremes. **Output data**: • A final database of all synthetical extreme rainfall events over Netherlands in 1000 years current weather conditions. • Semi-automatic method: an intermediate step in the method, has been developed to boost the 1000year calculation by screening favourable rainfall conditions. It requires a manual definition, for the region of interest, of "rainfall influencing zones". All other steps are automatic. • Current database calculation for Netherlands was performed on a 8192 cpu machine (thanks to European PRACE high performance computing facilities) for a 2-month duration. Currently optimised algorithm allows now to have same run duration over a 500 cpu machine only.
Results and figures	• Input data: Definition of "extreme" threshold: histogram of KNMI composite radar-rain gauge data (1% threshold is 27mm/hr):  • Illustration for the event database:

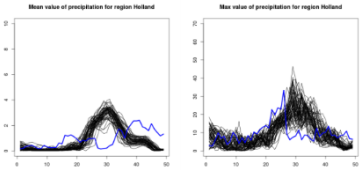


- Input data: illustration of the weather scenarios in the input NOAA20CR global database:

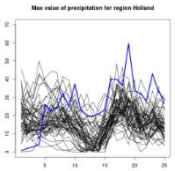


- Result: Reproduction by the NWP model (using the 56 global weather scenarios) of the KNMI observations of historical events (hourly time series):

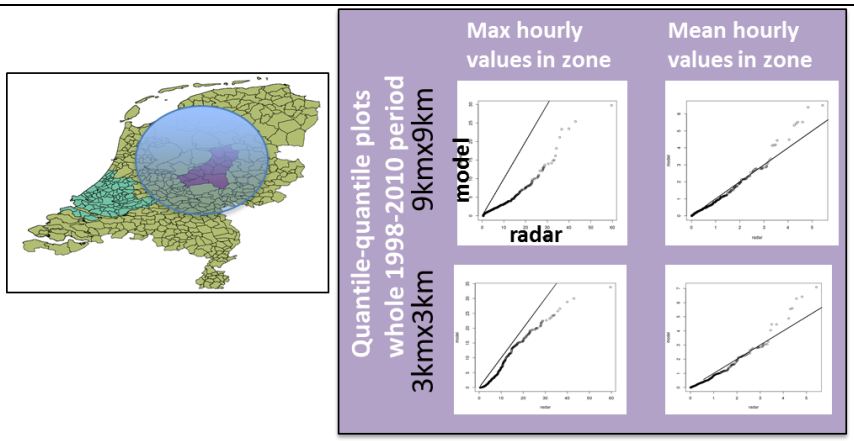
1998-09-13/14



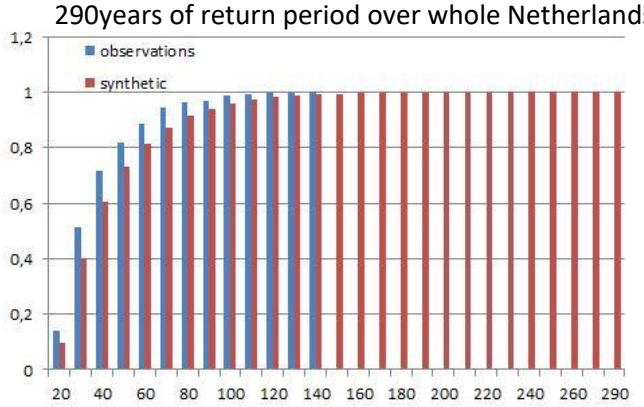
2002-08-24:



- Result: better performance of NWP model at current 3km resolution than at initial configuration at 9km resolution - illustration for statistical distributions of mean-max hourly rainfall amounts in central Netherlands



- Result: Comparison obs-model of cumulated distribution of the events (20 to 290years of return period over whole Netherlands):



Sample files

References

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