climada module **flood**   27 Jan 2015
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The CLIMADA module flood allows to generate flood hazard event sets and to conduct a probabilistic hazard risk analysis which quantifies the rate (of probability) of exceeding various flood heights at a specific geographic location. In particular, the flood module can be used to derive estimates of global country-specific expected flood damages over various return periods.

Consider the CLIMADA module country_risk[1] and/or GDP_entity[2] to generate the centroids for the earthquake model.

Flood: Hazard profile

Flooding is the most common environmental hazard worldwide. This is due to the vast geographical distribution of river floodplains and low-lying coastal areas. A flood is largely classified as 'an overflowing of water onto normally dry land' [1].

This encompasses the simple notion that a flood involves an excess of water compared with average water levels. Floods can be categorized as either river floods or coastal floods. River floods are often atmospherically driven, caused by excessive precipitation. They can also occur due to landslides falling into rivers, and by dam or levee failures. Coastal surges are often due to storm surges caused by tropical cyclones or tectonically produced tsunamis.

The primary effects of flooding include loss of life, damage to buildings and other structures, including bridges, sewerage systems, roadways, and canals. Floods also frequently damage power transmission and sometimes power generation, which then has knock-on effects caused by the loss of power. In the US, flooding has caused an average annual economic loss of US$ 8.2 bn and 89 fatalities over the last 30 years [2].

Overview of functions implemented

The CLIMADA module flood contains the following functions:

- `fl_centroids_prepare` prepares the centroids for the generation of a flood hazard event set by calling
    - `centroids_fl_score_calc` assigns flood scores and wetness indices to a given centroids structure
    - `centroids_basinID_assign` assigns basin IDs to the centroids based on HydroSHEDS basin outline shapefiles[3]. At its core, the function calls `basin_identify`, which identifies the basins the centroids are located in.
- `climada_fl_hazard_set` generates a flood hazard set by distributing rainfall volume into the basins according to the centroids' wetness indices
- `fl_hazard_plot_hr` makes plots of specific flood events

    further helper functions:
- `dem`
  `landcolor`
  `seacolor`
  These three functions allow to produce nicely colored plots of digital elevation data

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[1] See https://github.com/davidnbresch/climada_module_country_risk and there climada_high_res_entity
[2] See https://github.com/davidnbresch/climada_module_GDP_entity
[3] HydroSHEDS is a set of hydro information mapping products at regional and global scales. For more information and a technical documentation see http://hydrosheds.org/page/hydrobasins, and to download the basin shapefiles see http://hydrosheds.cr.usgs.gov/dataavail.php

Bibliography

[1] "Natural Disasters Association," [Online]. Available: http://www.n-d-a.org/flooding.php. [Accessed 16 March 2015].

[2] Hydrologic Information Center, "National Oceanic and Atmospheric Administration (NOAA)," [Online]. Available: http://www.nws.noaa.gov/hic/. [Accessed 16 March 2015].

Flood hazard analysis: A step-by-step guide

Creating a probabilistic flood hazard set for a country of your choice (we will use Italy as an example) requires the following steps:

[to be added]

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[1] Please note that the Climada module GDP_entity has to be installed for this step. Download: https://github.com/davidnbresch/climada_module_GDP_entity