Geophysical Research Abstracts
Vol. 20, EGU2018-759, 2018
EGU General Assembly 2018

Influence of the major oceanic and terrestrial moisture sources on continental precipitation in the month peaking precipitation

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Moisture transport from the oceanic and terrestrial sources to the continents, precipitation, and evaporation are important elements of the hydrological cycle and they play an important role on quality of human life in the Earth and manage many processes in terms of extreme events, as intense precipitation and/or flooding. The aim of this study is to identify the main monthly oceanic and terrestrial moisture sources regions at global scale and calculate their contribution on continental precipitation in the month when precipitation peaks for the period 1980 to 2015.
Using the global precipitation dataset from Multi-Source Weighted-Ensemble Precipitation (MSWEP) (Beck et al., 2017) and checking grid by grid (0.25 degrees in latitude and longitude horizontal resolution) we first calculated at a global scale the month which exhibits the climatological maximum precipitation (peaking month)
Then to identify the main oceanic and terrestrial moisture sources regions for each month we used the monthly climatological ERA-Interim vertically integrated moisture flux divergence (VIMF) from the European Centre for Medium-Range Weather Forecasts (ECMWF) reanalysis from January 1980 to December 2015 (Uppala et al., 2005). The oceanic moisture sources regions were identified on a threshold of the 50 percentile for the integrated moisture flux divergence ($\sim$750 mm/year) while for the terrestrial sources threshold is based on the 40 percentile ($\sim$500 mm/year) (Gimeno et al., 2010). A number of sources between 15 and 22 were detected depending on the month analyzed. For instance in January there were detected 19 sources (12 over the oceans, and 7 over the continents) and for July 22 (11 over the oceans, and 11 over the continents).
To estimate the contribution of these moisture sources regions to the precipitation over the continents in the peaking month we used the global trajectories outputs from the Lagrangian dispersion model FLEXPART v9.0. We tracked for each month those particles that leave from the selected moisture sources regions in a forward analysis, and then we calculated the moisture sinks regions of the moisture (as E-P<0) over continental areas. The final output is the contribution of the different sources of moisture (one or more) to the precipitation over each grid point in its peaking. For instance, there are areas of the world that are influenced by a single major source of moisture, so the available atmospheric moisture to force the extreme precipitations comes in a $\sim$100% from this source; but there are another areas that are influenced by several sources of moisture, so we calculated the percentage of influence by each one for the peaking month.

Keywords: moisture sources, Lagrangian approach, monthly extreme precipitation, moisture sinks regions.