

Interactive comment on “The dynamics of cultivation and floods in arable lands of central Argentina” by E. F. Viglizzo et al.

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Comment of Anonymous Referee 1:

As hydrologist it is hard to believe that the groundwater level may be interpreted as the triggering mechanism for floods. It may be a relevant component in flood production affecting the water storage capacity of the basin, but dynamics of floods can not be related with annual fluctuations in groundwater or rainfall. These two variables can be only used to define the mean state of the hydrological system. It is necessary to extend the work including the study of variable generally used in hydrology to study the hydrological extremes (e.g., annual maxima of rainfall). Only after this, if the rainfall extremes do not provide a good indicator for flooding frequency and extension one can take into consideration other possibilities.

Reply from Jobbagy, E G:

The Pampas are an extremely flat setting, particularly when regional slopes (across distances of 1 km or more) are considered (Tanco & Kruse 2001, Jobbágy et al in press). In most of the Pampas, however, small-scale slopes (across distances of less than 1 km) are larger than regional slopes because of the dune landforms shaped by intense aeolian activity during the Holocene. In this context local slope and hydraulic gradients overwhelm regional ones, favouring local flow systems over intermediate and regional ones (sensu Toth, 1963). In this setting the expansion of flooded areas is associated with gradual water level raises and eventual coalescence of ponds and shallow lagoons. This process does not necessarily result from extreme and intense rainfall events or even less from stream/river derived inputs, which do not exist in the region, but, more typically, from extended periods of water excesses. Accumulated water excesses leave the systems with a thin unsaturated zone (high water table levels) unable to host additional water inputs that end, as a result, surface water bodies in the lowest portions of the landscape. Floods in most of the Pampas are more likely to develop through saturation-excess overland flow and subsurface flow than through infiltration-excess or Hortonian flow (Sophocleus 2002). For this reason the dynamics of floods are not of high frequency (i.e. flash floods) but of slow initiation and even slower retraction. Local influences on recharge and discharge fluxes could play a strong role in the Pampas, regulating the water budget (and area) of ponds and lagoons (Meyboom 1967).

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