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EDITORIAL

Interdisciplinarity helps solving real-world problems

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In recent decades, there have been increased evidences of observed impacts related to the evolution of climate, in terms of mean changes and extremes, on natural and human systems. The investigation of extreme events and their relations to climate change is a very active area in climate research as proved by the great attendance in the session "Extreme events and impacts" that has been running during the European Geosciences Union (EGU) general assembly for more than fifteen years. The research on extremes is so vast that a large amount of expertise across a broad range of disciplines is increasingly required to study the multiple relations interlinking climate and resulting impacts. Therefore, the interdisciplinary approach focusing upon observed extreme events in a recent past, how these are linked to impacts, and the manner in which extremes and associated impacts may shift under global warming as expected in the twenty-first century, constantly brings new insights about the understanding of our planet, and fosters the acquisition of new knowledge about the many links inherent to the climate system on various scales of space and time.

One should therefore bear in mind that not all research in the domain of extreme events is integrated across disciplines to the same level. In terms of resolving real-world problems, the issue of whether to apply "weak" or "strong" interdisciplinarity is a function of whether the problem is likely to require a high level of interdisciplinarity or not. Analysis from observed or simulated data, from a statistical perspective, might not require the same degree of interdisciplinarity compared to that relating avalanches activity from tree rings as a surrogate for climate variables. The following four articles are meant as a small sample of topics covered during the above-mentioned session that exemplifies this interdisciplinarity.

First, the analysis of Scoccimarro et al. (2014), based on future projections of heavy precipitation events in Europe, shows how multi-model ensemble results can be used to study statistically the upper tail of the precipitation distribution. Their results led them to conclude that the increase in the width of the right tail is somewhat linked to the availability of the atmospheric water column in a warmer climate, and the latter in this way may be the cause of more severe rainfalls.

The second by Ruiz-Villanueva et al. (2014) gets into the decadal variability of floods in Poland for the present and future climate conditions, questioning about the magnitude and intensity of such extremes. The data analysis from the mid-twentieth century onwards shows that there has been a shift in seasonality of floods magnitude which is in accordance with other diagnostics with simulated outputs from global and regional climate models.

The third, by Lorenzo et al. (2015), studies winegrowing in Spain in relation to actual and future climate conditions on the basis of multi-model simulated outputs. Despite some disagreements amongst model results, the analysis shows that climate change will tend to have both a positive effect in some regions and some negative effects in others. The computational mesh of today's regional climate models allows to reach some level of details about the impacts of climate on agricultural practices, but the lack of common model responses in space prevents unequivocal conclusions.

Finally, the use of tree-ring data to infer the avalanche–climate relations in the French Alps by Schläppy et al. (2015) shows that dendrogeomorphology is becoming a

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useful tool to infer past avalanche activity in mountain region in order to devise statistical relations between snow and climate variables.

Observations show that climatic extremes generally exert far more damage to human, economic, and natural systems than changes in mean climate. However, in order to gain a better understanding of the consequences of the ensuing impacts, research on extreme events must continuously be supported. Past, present, and future environmental and socio-economic impacts of extreme climatic events based on interdisciplinary approaches will thus surely remain a hot issue in the years to come.

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