There will be floods

In the context of an international research project, Vienna-based researcher GÃ¼nter BLÃ–SCHL is investigating changes in the frequency of flood events in Europe. Climate change will increase their number in Western Europe in the future. Austrian Science Fund, FWF / H2o september 2021.

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Austrian Science FundÂ - FWF

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According to popular opinion, natural disasters are on the rise and floods in particular seem to be occurring more frequently than in the past. The blame, or so the theory goes, lies with the atmosphere, which has become warmer and can absorb more water, resulting in more heavy rainfall and floods. GÃ¼nter BlÃ¶schl, a hydrologist at the TU Wien (Vienna University of Technology), however, disagrees with this popular explanation for the changes: "While our measurement data tell us that there is indeed more flooding in western Europe, the floods are tending to become less frequent in eastern Europe, where snow has an important impact."Â Hence, as so often in life, the situation is a bit more complicated. BlÃ¶schl wants to shed light on this within the context of a cooperative research project involving institutions from Germany, Austria and Switzerland. The Austrian Science Fund, FWF, is funding the Austrian part of the project.

History of the floods

As a matter of fact, changes in the frequency of floods are not altogether unusual. History has always known periods richer or poorer in floods. "It can be shown that we are currently in a flood-rich period in central and north-western Europe, and it doesn't look as though it's going to cease." But is human activity the root cause of this increase in frequency? In order to find out, GÃ¼nter BlÃ¶schl is looking at the natural cycles of flood frequency. "For this purpose, we have already evaluated historical data in Europe in previous projects and quantitatively described the history of floods in Europe over the past 500 years." The comparison is important, he says, because 500 years ago human influence was still negligible.

BlÃ¶schl's team works with very heterogeneous data. "We have a lot of different data, such as remote sensing data on soil moisture and snow. In addition, we have the traditional meteorological and hydrological data, which cover much longer periods of time. What is particularly important for us is measuring river water levels," explains the hydrologist, noting that the latter can be measured particularly precisely. Apart from the current data and the data collections of the past 60 years, there are also historical records that contain important information. To this end, BlÃ¶schl's group worked with a historian who searched archives for information about floods. "We were able to see that in the past, apart from the past three decades, the cold periods were the ones with lots of floods, not the warm ones," BlÃ¶schl reports.

BlÃ¶schl emphasises that this shows that the warming of the atmosphere is not directly responsible for the increase in floods. While it is true that the atmosphere absorbs more water, the influence on regional floods is nevertheless minor. What is more important is the change in weather systems. "The fact that floods are on the rise in north-western Europe, for example in the UK or Germany, is not a result of it being warmer, but rather because the trajectories of the weather systems that trigger floods have shifted further north. This is only very indirectly related to the air temperature," explains BlÃ¶schl. A much stronger impact, he says, comes from the influence of air pressure distribution and the expansion of rainfall over Africa. "It is rather a global change in circulation patterns that makes the difference," says BlÃ¶schl, adding that to a certain extent this is caused by climate change.

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Coherent database

The activities of the current FWF project are a continuation of work that BlÃ¶schl has carried out over the past ten years in the context of an ERC Advanced Grant from the European Commission.Â "We were in the fortunate situation to really break new scientific ground,"Â says BlÃ¶schl. Previously, the scientific results on changes in flood frequency had been very heterogeneous. His team has created the first consistent database.Â "This coherent database offers the advantage that we don't pick out individual measuring stations, but look at many thousands of stations together. And suddenly, as if by magic, spatial patterns emerged that were previously invisible,"Â says BlÃ¶schl.

BlÃ¶schl stresses that this research is strongly international in character. In the current project, his group in Vienna is responsible for the long-term cycles, and the group in Stuttgart is interested in the spatial distribution, while the Frankfurt group is dealing with atmospheric issues and the connection to the ocean. In addition, GÃ¼nter BlÃ¶schl, until recently the president of the International Association of Hydrological Sciences, is in contact with research teams from all European countries. He reports that the network is very good and that the teams share their data with one another. The overall situation in Europe is of interest to all of them.

Floods on the rise

In the future, the current trend will intensify. This is a conclusion BlÃ¶schl can draw from his data with a high degree of

reliability.Â "Austria lies in the transition zone between the northwest and the south of Europe. We are - and that's the good news - less affected by changes than England, for example, but we are affected,"Â says BlÃ¶schl.Â "Floods will increase north of the main Alpine ridge. South of that ridge, in Carinthia for instance, the situation is more or less stable."Â But there may well be sharp increases in smaller river valleys that are not in the vicinity of the Danube, Salzach or Drava. England and the Netherlands are really badly affected.Â "But the administrations of these countries are aware of that,"Â notes BlÃ¶schl and says that they are preparing for it - not least thanks to the findings of his research team and their international colleagues.
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GÃ¼nter BlÃ¶schl

GÃ¼nter BlÃ¶schl is a hydrologist and head of the Institute of Hydraulic Engineering and Engineering Hydrology at TU Wien. He is a visiting professor at international universities such as Tsinghua University in Beijing, and between 2017 and 2021 he was President of the International Association of Hydrological Sciences. He is the recipient of numerous awards, most recently the Prince Sultan Bin Abdulaziz International Prize for Water in 2018. He is interested in flood and drought prediction, scaling problems and the impact of climate change on the hydrological cycle. The international project â€œLong-term variability of extreme flood eventsâ€• (2020-2023) is funded by the Austrian Science Fund FWF with 375,000 euros.

PublicationsÂ

Bertola M., Viglione A., Vorogushyn S., Lun D., Merz B., BlÃ¶schl G.: "Do small and large floods have the same drivers of change? A regional attribution analysis in Europe", in: Hydrology and Earth Systems Sciences, Vol. 25, 1347-1364, 2021Â Â

Bertola M., Viglione A., Lun D., Hall J., BlÃ¶schl G.: "Flood trends in Europe: are changes in small and big floods different?", in: Hydrology and Earth Systems Sciences, Vol. 24, 1805-1822, 2020

Doris Duethmann and GÃ¼nter BlÃ¶schl. "Why has catchment evaporation increased in the past 40 years? A data-based study in Austria", in: Hydrology and Earth Systems Sciences, Vol. 22, 5143-5158, 2018

BlÃ¶schl G., Hall J., Parajka J., PerdigÃ£o R. et al.: "Changing climate shifts timing of European floods", in: Science, 2017Â

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