

Climate change: 20th century the wettest in Pakistan for 1,000 years

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Since the beginning of industrialisation the amount of precipitation in Pakistan has increased considerably. This is shown by what is the first evaluation worldwide of isotopes in the annual rings of juniper trees which are more than 1,000 years old.

In the forthcoming issue of the journal *Nature* on 27 April, scientists from the Swiss Research Institute WSL, the Potsdam Geo Research Centre, the Jülich Research Centre and the University of Bonn report that these show that the 20th century was the wettest century in the past millennium in northern Pakistan. The reason could be global warming: when the temperature rises, the atmosphere can store more humidity, which in turn results in more snow and rain falling. The increase in precipitation is unprecedented, at least for the last 1,000 years. The researchers therefore conclude that human influence is not unlikely.

Annual rings are sensitive indicators of the climatic and environmental conditions in which they grow. 'If trees become stressed – for example in particularly dry years – their trunk growth is less than in good times,' Professor Matthias Winiger, of Bonn's Geographical Institute, says. 'The annual rings then tend to be correspondingly close together.' The analysis of the oxygen absorbed by the wood is even more revealing. For this the ratio of two varieties of oxygen which differ in weight, what are known as isotopes, is measured. 'This method is extremely complex, but permits very exact statements to be made about the humidity conditions in the year in question,' Professor Winiger explains.

The team of scientists examined four stocks of trees in the Karakorum Mountains and the Himalayas. Juniper trees can live to a ripe old age. In one of the stocks of trees the annual rings could be followed back to 828 A.D. Their wood is thus a very reliable ‘climate archive’ going back more than 1,000 years. In order to estimate the accuracy of the data, the researchers compared the precipitation graphs based on the annual rings over a reference period with observation data from meteorological stations. However, these have only been available in the mountains of Pakistan since 1898. ‘For this period of time our method tallies remarkably well with the meteorological data,’ Professor Winiger emphasises.

The results show that there must have been particularly wet periods in the past, too, e.g. around 1200 or 1350. However, in the late 19th and the whole of the 20th centuries such ‘precipitation peaks’ were both especially high and remarkably frequent. The development of precipitation in Pakistan thereby shows parallels with the global rise in temperature which has been observable over the past 150 years. Among other effects it influences atmospheric processes, particularly what is known as the atmospheric circulation. By this scientists mean the global air currents which are primarily driven by the warmth irradiated by the sun.

It is presumed that climate change can at least in part be traced back to the green-house gases such as carbon dioxide and steam, which are produced directly or indirectly by human beings. The authors of the study reveal that they are themselves concerned about their findings: they write that ‘in these sub-tropical and peripheral tropical regions changes in the precipitation rate and distribution and thus in the water balance would have a much greater impact on people’s well-being and changes in the eco-systems than the change in temperature on its own.’

Source: University of Bonn

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