PRESS RELEASE

**Tree rings reveal how volcanic eruptions have shaped the climate and history over the past two millennia**

**Brno, 1st October 2020 - An international team of scientists led by Professor Ulf Büntgen from the Global Change Research Institute CAS and the University of Cambridge presented a new approach to climate reconstruction in the journal called Dendrochronologia. The reconstructed climate thus provides a new perspective on historical periods in which climatic extremes and associated environmental reactions have probably had an extremely great impact on social events. Among other things, scientists have shown that in the last two millennia, volcanoes have played a greater role in natural temperature variability than originally thought.**

Reconstruction of the climate in the past (pre-instrumental period) is important, among other things, for the prediction of climate models, because it provides knowledge about the spatial and temporal variability of climate and their causes. The data from the instrumental period are insufficient to understand and reveal the causes of long-term change, they do not include the most significant cases of extreme weather events that we know from history and they do not inform us about the effects of climate fluctuations and impacts of meteorological extremes on nature and society.

To reconstruct the climate in the periods before it was instrumentally measured, we use data from natural archives, the so-called proxy data, of which the tree ring widths are most commonly used. Nevertheless, the limiting factor is the lack of precisely dated proxy data, especially from the first millennium and from the areas of the southern hemisphere.

Ulf Büntgen’s team tried to uncover the possible connection between volcanic activity and the climate and their impact on historical social events. For this purpose, the researchers analyzed period records and updated annual chronologies composed of annual rings of living and relict trees from areas of the northern hemisphere with high altitude and latitude. Among other things, these trees show a high sensitivity to temperature. The chronologies that were used cover the entire period of our era (from 1 to 2020). Volcanic activity is one of the important climate-forming factors due to the presence of volcanic aerosols in the stratosphere. These aerosols reduce the amount of solar radiation falling on the earth's surface. Correlations of annual ring widths with regional summer temperatures measured in 1950–2002 were used for data verification.

According to prof. Büntgen, the study is beneficial in at least five key respects: 1. A continuous series of proxy records has been successfully created using tree rings from nine regions of the USA, Canada, Scandinavia, the Austrian Alps, northern Siberia and the Altai since the beginning of our era; 2. Climate reconstruction, covering the years 280, 990 and 1020 of the Roman Empire and the early Middle Ages, which are associated with peak warming due to the absence of volcanic activity, shows that warming levels are likely to exceed those of the late 20th century and the first decade of 21st century; 3. The variability and amplitude of summer temperatures in the first millennium was greater than previously thought, and the lowest temperature anomaly in 536 was the beginning of the coldest decade and the onset of the so-called Late Antique Little Ice Age (LALIA); 4. It proves that relatively stable periods with warm summers were associated with prosperity and social stability in Europe and

China, and vice versa, during colder episodes caused by volcanic activity, there were conflicts and economic decline; 5. Precisely dated climate reconstructions help to shed light on historical periods of history in which climatic extremes and related environmental reactions had an extraordinary impact on social events.

According to prof. Büntgen, the article will arouse great interest of the professional public in the fields of natural, social and human sciences, because the use of high-resolution paleoclimatic data can help answer important historical questions. *“We are convinced that the generation, interpretation and integration of high-resolution proxy archives promises to answer such critical questions as: How have climatic changes and other environmental factors impacted human demographics, settlement, social structure, agriculture, commerce and conflict; and what climate conditions may be conductive to establishing and sustaining panzootics and pandemics? How did societies respond to diverse and variable climates, and why were some societies more successful than others? What role did past volcanism play in the waxing and waning of major polities and migrations?,”* said Ulf Büntgen.

**Source:**

Ulf Büntgen et al. ‘[*Prominent role of volcanism in Common Era climate variability and human history.*](https://www.sciencedirect.com/science/article/pii/S1125786520300965?via%3Dihub)’ Dendrochronologia (2020). DOI: 10.1016/j.dendro.2020.125757

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