

COSMOGENIC ISOTOPES: SOLAR ACTIVITY AND CLIMATE

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Today, climate change and global warming are hot topics not only in science but also in the media. While, for obvious reasons, the main focus of the discussion is on the anthropogenic greenhouse effect one should not forget the Sun which is the main driver of the climate system and very likely plays also a significant role in climate change. Satellite based measurements over the past 30 years show that the electromagnetic radiation received by the Earth changes in phase with the solar magnetic activity. While the total solar irradiance (TSI) varies by about 0.1% over an 11-y Schwabe cycle the change in UV-part of the spectrum is much larger.

In order to investigate the role of the Sun in climate change the observational record of TSI has to be extended much further back into the past. For this purpose the relationship between TSI and solar activity and the long-term history of solar activity have to be known. The relationship between TSI and solar activity can be derived from the observational data. The long-term solar activity can be reconstructed by making use of cosmogenic isotopes which are produced in the atmosphere by cosmic rays. Since the cosmic ray intensity is modulated by the solar activity the production rate of cosmogenic isotopes reflects the solar activity. Measuring cosmogenic isotopes in natural archives such as ^{10}Be in ice cores and ^{14}C in tree rings reveals the solar activity over the past 10,000 years.

A comparison of the reconstructed TSI with paleoclimate records provides clear evidence for solar forcing of the climate during the past millennia.

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