The green Sahara, a desert in bloom

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Dr. Rik Tjallingii investigates the Earth&acutes climatic past by analysing sediment cores from the sea floor; here at the Institute of Geosciences at Kiel University.

Reconstructing the climate of the past is an important tool for scientists to better understand and predict future climate changes that are the result of the present-day global warming. Although there is still little known about the Earth's tropical and subtropical regions, these regions are thought to play an important role in both the evolution of prehistoric man and global climate changes. New North African climate reconstructions reveal three 'green Sahara' episodes during which the present-day Sahara Desert was almost completely covered with extensive grasslands, lakes and ponds over the course of the last 120.000 years.

The findings of Dr. Rik Tjallingii, Prof. Dr. Martin Claussen and their colleagues will be published in the October issue of *Nature Geoscience.*

Scientists of the MARUM – Center for Marine Environmental Research in Bremen (Germany) and the Alfred-Wegener-Institute in Bremerhaven (Germany) studied a marine sediment core off the coast of Northwest Africa to find out how the vegetation cover and hydrological cycle of the Sahara and Sahel region changed. The scientists were able to reconstruct the vegetation cover of the last 120.000 years by studying changes in the ratio of wind and river-transported particles found in the core.

"We found three distinct periods with almost only river-transported particles and hardly any wind dust particles, which is remarkable because today the Sahara Desert is the world's largest dust-bowl," says Rik Tjallingii. He now works at Kiel University, researching within the cluster of excellence 'The Future Ocean'. The scientists explain these periods by an increase of the precipitation that resulted in a much larger vegetation cover resulting in less wind dust and stronger river activity in the Sahara region. The green Sahara episodes correspond with the changing direction of the earth's rotational axis that regulates the solar energy in the tropical Atlantic Ocean. Periods of maximum solar energy increased the moisture production while pushing the African monsoon further north and increasing precipitation in the Sahara.

To validate their interpretations, the scientist compared their geological reconstruction with a computer model simulation of the Sahara vegetation cover, performed by the research group of Prof. Dr. Martin Claussen. Dr. Claussen is Director of the Max-Planck-Institute of Meteorology in Hamburg and chairs the cluster of excellence 'Integrated Climate System Analysis and Prediciton' at the University of Hamburg. The computer model simulation shows three periods with an almost completely vegetated Sahara at the same time as seen in the geological record. This supports the interpretation of geologists and, in turn, demonstrates the value of computer model results.

Additionally, the computer model indicates that only a small increase in

precipitation is sufficient to develop a vegetation cover in the Sahara. Computer model simulations for the future suggest an expansion of the vegetation cover in the Sahara Desert if human-driven climate change leads to aggressive global warming. However, it is difficult to conclude that the Sahara will actually become greener than it is today, as the simulations do not account for the influence of human activity in this area.

Source: Kiel University, Germany

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