Geophysical Research Abstracts
Vol. 16, EGU2014-6567, 2014
EGU General Assembly 2014

Water management in the Roman world

Brian J. Dermody (1), Rens L.P.H. van Beek (2), Elijah Meeks (3), Kees Klein Goldewijk (4), Marc F.P. Bierkens (2), Walter Scheidel (5), Martin J. Wassen (1), Ype van der Velde (6), and Stefan C. Dekker (1)

(1) Dept. of Environmental Sciences, Utrecht University, the Netherlands, (2) Dept. of Physical Geography, Utrecht University, the Netherlands, (3) Stanford University Library, Stanford University, USA, (4) Netherlands Environmental Assessment Agency, De Bilt, the Netherlands, (5) Dept. of Classics, Stanford University, USA, (6) Dept. of Soil geography and landscape, Wageningen University, the Netherlands

Climate variability can have extreme impacts on societies in regions that are water-limited for agriculture. A society's ability to manage its water resources in such environments is critical to its long-term viability. Water management can involve improving agricultural yields through in-situ irrigation or redistributing water resources through trade in food. Here, we explore how such water management strategies affected the resilience of the Roman Empire to climate variability in the water-limited region of the Mediterranean.

Using the large-scale hydrological model PCR-GLOBWB and estimates of landcover based on the Historical Database of the Global Environment (HYDE) we generate potential agricultural yield maps under variable climate. HYDE maps of population density in conjunction with potential yield estimates are used to develop maps of agricultural surplus and deficit. The surplus and deficit regions are abstracted to nodes on a water redistribution network based on the Stanford Geospatial Network Model of the Roman World (ORBIS). This demand-driven, water redistribution network allows us to quantitatively explore how water management strategies such as irrigation and food trade improved the resilience of the Roman Empire to climate variability.