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Simulation of Interannual Rainfall Variability in Mediterranean Islands during the Neolithic and Metal Ages

Christian DEPRAETERE¹, Helen DAWSON² & Stéphane PLOIX³

1 Affiliation. UMR Espace-DEV, Maison de la Télédétection, Montpellier, France

2 Affiliation. Dipartimento di Storia Culture Civiltà, Piazza San Giovanni in Monte 2, Bologna, Italy

3 Affiliation. G-SCOP lab, Grenoble Institute of Technology, Grenoble, France

During the approximately 10,000-year of the Neolithic and Metal Ages, the Mediterranean islands are characterized by intermittent phases of settlement and abandonment by farming populations, particularly on the smaller islands. The causes of these periods of abandonment, whether concomitant or not, are a matter of debate within the archaeological community; some are linked to historical events (conflict, raids, insecurity, epidemics, etc.), others to climatic fluctuations with alternating dry and wet periods on a local or regional scale.¹

The aim is to simulate fluctuations in annual rainfall over the several millennia under consideration, by calibrating on the interannual variability of rainfall observed at 7 weather stations located along a Mediterranean island transect: Cyprus, Rhodes, Crete, Malta, Sicily, Sardinia and Menorca. The assumption will be made not to take into account climatic fluctuations of greater magnitude and duration, and to focus solely on the erratic nature of annual rainfall totals in the Mediterranean regime, including during the historical period under consideration.

Starting with a calibration of the data observed at the 7 current stations, a stochastic generator of random annual rainfall chronicles "without memory"² over several thousand years enables us to study the frequency of occurrence of more or less marked infra or supra-decadal dry periods (DDP³) likely to jeopardize the survival of island farming communities, leading to the eventual abandonment of certain islands.

Although variable depending on the island region considered, simulation results suggest that the frequency of occurrence of DDPs may have impacted several generations of farmers over several millennia. It is likely that this constant confrontation with rainfall hazards has led to the gradual development of a "risk culture" in intergenerational memory. It is probable that this constant confrontation with rainfall hazards led to the gradual development of a "risk culture" in the intergenerational memory of farming communities over the long period of Neolithic evolution, particularly in the constrained space of small islands.

The archaeological theory of "island abandonments" emphasizes that the intensity and duration of certain dry periods may have led to "stay or go" choices, as

¹ Dawson 2014

² No Markov-type assumptions.

³ DDP : Decadal Dry Périod of 5 to 20 years.

the situation became a matter of life and death⁴. The dilemma is all the greater in an island environment, where migration by boat, total abandonment of the land and the prospect of resettlement are far more difficult than in continental regions.

In his book *Homo domesticus*, the anthropologist James Scott defines the prehistoric Neolithic period as a "running period" lasting several millennia before the appearance of the first states during the Metal Age, while specifying that it involved several hundred generations of farmers⁵. Such concrete, multi-generational experience of rainfall hazards over such a long period would have enabled them to develop know-how in terms of resilience to rainfall hazards, and to demonstrate innovation: the oldest wells, for example, are found on the island of Cyprus and date back to 8500 BC⁶. Although empirical, this knowledge contributed to the emergence of a pre-scientific reflection on climate and its variations, inherited by the first civilizations. Archaeologists and hydrologists alike agree that small islands are paradigmatic areas for studying the relationship between climatic hazards, water resources and early agricultural societies⁷.

Keywords: Mediterranean islands, paleoclimate, Neolithic, stochastic generator, interannual rainfall variability,

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⁴ Dawson 2010, pages 201 and 205.

⁵ Scott 2021.

⁶ Dawson 2015, page 18.

⁷ Schön et Dierksmeier 2021, page 151.