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Editorial

Quaternary Highlights (July–September 2018)

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Editorial summaries of selected papers relevant to Quaternary science published in high-impact multidisciplinary journals between 1 July and 10 September 2018. Other relevant papers published in the same journals during the same period are also listed.

1. Climate Change and Mountain Erosion

The idea that late-Cenozoic climatic cooling leading to Pleistocene glaciations has accelerated global erosion rates on mountains, especially on glaciated ones, has dominated the scene during the past years. Such a conclusion may have significant implications for the understanding of complex interactions among climate, landscape, and tectonics, which is relevant for anticipating potential responses to future environmental change. Schildgren et al. [1] re-analyzed the empirical evidence—i.e., thermochronological data from 30 sites around the world, as proxies for exhumation history—and concluded that the resolution of the dataset is insufficient to support a global increase in erosion rates due to the late-Cenozoic climatic cooling. According to these authors, only three of the 30 localities utilized to support a purported increase in global erosion rates show a real climatically-induced acceleration due to local glacial valley incision. In four other locations, erosion increases are explained in terms of tectonic changes. In the remaining 23 localities, the combination of evidence from places with different exhumation histories introduces a spatial correlation bias that merges spatial and temporal variability thus creating a false impression of globality. Schildgren et al. end by recommending the consideration of location-specific aspects in global data analyses.

2. Hominins May Have Left Africa Earlier Than Thought

Until very recently, the earliest evidence of the genus *Homo* outside Africa *was from Georgia, in the Caucasus, and* dated approximately 1.8 million years ago (Ma). Slightly younger remains attributed to *H. erectus* were known in China (1.6–1.7 Ma), and in Java, Indonesia (1.5–1.6 Ma). Zhu et al. [2] report a large and continuous sequence of hominin artefacts from the Southern Chinese Loess Plateau, which extended from approximately 2.1 to 1.3 Ma. Dating, a crucial point in this type of discovery, was performed by paleomagnetism in combination with orbital tuning, on the Loess interval where artifacts were preserved. The authors of this study suggest that hominins were present in the region between these dates, although in an intermittent, rather than continuous, fashion. These results imply that hominins had already reached China by 2.1 Ma, at least 400,000 years before it was previously thought, which demands a reconsideration of the timing of the first hominin dispersal out of Africa.

3. Permafrost: Past, Present and Future

The carbon stored in the permafrost during the Last Glacial Maximum (LGM) is believed to have contributed to the increase of atmospheric CO_2 concentration during Lateglacial-Holocene melting. This has been considered a potential past analog for near-future estimations of eventual CO_2 increases after the thaw of present-day permafrost areas, under the projected global warming. Lindgren et al. [3] estimate the carbon content of the northern LGM permafrost and find that it is smaller than the present carbon stock of the same region, including both permafrost and non-permafrost areas. Therefore,

although the permafrost area has decreased by >10 million km^2 since the LGM, the carbon content of the present soils has increased by ~400 petagrams, which suggests that the melting of the LGM permafrost has not contributed to the net increase of atmospheric CO_2 concentration. According to these authors, the postglacial warming and the corresponding permafrost thaw resulted in an initial loss of ~1000 petagrams of carbon but this was compensated by the accumulation of this element in deglaciated soils and peatlands. Lindgren et al. question the utility of the post-LGM permafrost dynamics as a potential past analog for the future global warming.

4. Bread Preparation Predated the Neolithic Revolution

Bread preparation and consumption has been commonly associated to the Neolithic revolution, starting at about 9–10 cal kyr BP in the Near East (southwest Asia), after the domestication and regular cultivation of cereals such as wheat and barley. Pre-agricultural evidence for the use of cereals to produce bread is not available. In a hunter-gatherer archaeological site from Northeastern Jordan, previously dated to 14.6–11.6 cal kyr BP, Arranz-Otaegui et al. [4], using detailed SEM (scanning electron microscope) analyses, describe and characterize a number of charred fragments identified as bread-like, possibly made of wheat, rye, millet, oat and/or barley. This finding is the very first record of a bread-like meal available to date and predates by at least 4000 years the emergence of agriculture in the Near East. According to the authors, this demonstrates the use of baking techniques by hunter-gatherer societies and opens new perspectives in the study of the diet and cooking technology of pre-agricultural societies, as well as in the transition from foraging to food production.

5. Last Glacial Maximum Sea Levels

Broadly speaking, the last glacial maximum (LGM) occurred between 26.5 and 19 cal kyr BP and was characterized by an estimated sea-level drop of 115 to 135 m below its present position. However, more precise local and high-resolution trends are needed for glacio-isostatic modelling. A recent detailed chronological study of submerged LGM fossil corals of the Australian Great Barrier Reef (GBR), carried out by Yokoyama et al. [5], reports that sea level was around 110 m below its present position (−110 m) before ~22 cal kyr BP, when it experienced and abrupt 20 m drop to about −130 m, followed by a gradual increase to its present position starting at 20.5 cal kyr BP. The abrupt 22 cal kyr BP drop is attributed to a quick episode of global cooling and increased ice growth worldwide. Using glacio-isostatic modelling, the authors conclude that, globally, the LGM culminated at 20.5 cal kyr BP and the lowest global sea level was between 125 and 130 m below its present position.

6. Denny: The First Known Human Hybrid

Finding a direct descendant from two humans (s.l.) belonging to genetically different groups is extraordinary and of paramount importance in the study of human evolution. Using DNA analysis, Slon et al. [6] provide the first direct record of this type by demonstrating that a >50,000-year old bone fragment from the Russian Denisova Cave belonged to a hybrid individual (called Denny by the authors) with a Denisovan father and a Neanderthal mother. Evolutionarily speaking, the Neanderthals (Western Eurasia) and the Denisovans (Eastern Eurasia) diverged about 400,000 years ago, possibly due to their limited geographical overlap and the reduced fitness of hybrids. Both groups became extinct and replaced by modern humans around 40,000 years ago. The authors of this study suggest that, despite the fact that encounters would have not been frequent, mixing among Late Pleistocene hominin groups would have been frequent when they met.

7. Other Relevant Papers

For further relevant readings, see Caley et al. [7], Hazzi et al. [8], Hildebrand et al. [9], Maier et al. [10], Nogués-Bravo et al. [11], Nolan et al. [12], Scerri et al. [13], and Taylor et al. [14].

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