Climatic window for the "Out of Africa" exodus of early modern humans: evidence from desert stalactites

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The African origin of the early modern humans (EMH) ~200 kyr ago is well documented, but the later expansion of EMH out of Africa and routes they followed are still debated. Remains of EMH and related sites of African Middle Stone Age industry found across eastern Sahara and the Arabian Peninsula, suggest a migration route from tropical east Africa to the north and north-east. Evidence from the Levant indicates that one of the major waves of EMH expansion out of the African continent occurred between 130 and 100 kyr. All possible migration routes leading from Africa to the Levantine EMH sites converge in the southern Levant (Sinai Peninsula of Egypt, southern Israel and southern Jordan). During the period of EMH emergence from Africa, the southern Saharo-Arabian Desert experienced increased monsoon activity, but it was not known if the increase in rainfall also include the southern Levant and the northern parts of the migration corridor. Here we report the occurrence of humid phase between 137 and 110 kyr, based on U-Th dating of speleothems from caves located in presently arid to hyper-arid region, the central and southern Negev Desert, southern Israel. This formation of speleothems implies the existence of much wetter conditions in the past. Dating of speleothems from 5 caves in central and southern Negev Desert shows that last significant humid phase in the region occurred intermittently between 137 and 110 kyr with a peak at 132 to 122 kyr, simultaneous with the increase in monsoon activity in southern and central Saharo-Arabian Desert. In contrast to the northern and central Israel where thick speleothems continiously deposited during the last 250 kyr with rainfall sourced from Atlantic-Mediterranean fronts, the Negev Desert speleothems are thin (5-10 mm) with C and O isotopic compositions indicating a probable tropical source with short episodes of heavy precipitation alternating with long droughts. These episodic rainfall increases would have allowed the southern Levant desert to be more suitable for dispersal of ancient humans. The 137-110 kyr humid phase was preceded and followed by hyper-arid conditions, thus reinforcing the view that climate change had a major role in constraining the timing of EMH dispersal.