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Holocene climate swings and cultural changes in the Atacama desert, northern Chile

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The Atacama Desert, northern Chile, experienced several high-amplitude moisture changes during the Holocene. Water availability is the limiting factor for flora, fauna and ultimately human habitats. New data from lake sediments and archaeological excavations reveal that the Holocene cultural and technological evolution is tightly linked with millennial- to century-scale moisture fluctuations. Initial human colonization around 13 cal kyr B.P. coincided with a rapid change from extremely arid to humid environments with paleolakes, glaciers and extended grasslands and wetlands. Hostile environments prior to this time may explain why human occupation of the Atacama Desert lagged behind first occupations in Central Chile and Patagonia. The assemblage of projectile points suggests a Pacific route for the early exploration of this part of the world (Grosjean et al. 2005). Following a dramatic mid-Holocene regression of paleolakes, people abandoned paleo-shoreline and spring sites between ca. 9-4.5 cal kyr B.P. but appeared in alternative newly formed habitats such wetlands on exposed paleolake floors or in valleys. This re-organisation of the human settlement pattern is thought to reflect environmental stress. Domestication of camelids, the diversification of the lithic tools and initial residential architecture (semi-sedentarism) is observed during this period. The second late Holocene phase of widespread human occupation of the desert (after 3.6 cal kyr B.P.) coincided with the recuperation of lake levels. This phase brought irrigated agriculture and pottery. Synchronously with the late Holocene peak lake levels peaked (2.9 to 2.1 cal kyr BP), complex societies emerged with iconic metallurgy (Cu, Au), offerings and ritual human burials, and extended settlements. Larger settlements in marginal areas collapsed and were abandoned during the subsequent increase in aridity with low lake levels until ca 1.1 cal

kyr B.P. Paleodata suggest that the Holocene fluctuations in precipitation are related to the South American summer monsoon system. A coincidence with millennial-scale cyclic fluctuations in the North-Atlantic area, as it is concluded from sediments of Lake Titicaca (Baker et al. 2005) is not conclusive from our data.

References: Baker, P.A., Fritz, S.C., Garland, J., and Ekdahl, E. (2005). Holocene hydrologic variation at Lake Titicaca, Bolivia/Peru, and its relationship to North Atlantic climate variation. Journal of Quaternary Science. Grosjean, M., Núñez, L., and Cartajena, I. (2005). Palaeoindian occupation of the Atacama Desert, northern Chile. Journal of Quaternary Science.