Geophysical Research Abstracts
Vol. 14, EGU2012-13825, 2012
EGU General Assembly 2012

PIG2LIG-4FUTURE: a database

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The ability to simulate the rhythm of abrupt climate changes (ACCs) will depend on the availability of high quality palæoclimate databases with sufficient temporal resolution to make relevant inferences from a human perspective. This study presents the PIG2LIG-4FUTURE database (P2L-4F db). The philosophy behind is to facilitate access to data not only for the scientific community, but also for those outside this community and, in doing so, ensure that the data are as useful as possible to help in answering a challenging key question: What is the risk of ACCs in periods similar to the present one?

The P2L-4F db identifies an intra- and inter-event stratigraphy. A breakdown of the events in the PIG (present interglacial, time period from which more information is available and it is reasonably well dated) is defined in order to (2) identify ACCs in the LIG (last interglacial, much less known and dated period) for (4) better evaluation of the likelihood of sudden shifts within warm climate behaviour (i.e. next centuries, FUTURE). For this db, both the PIG and the LIG include deglaciation and interglacial states and they are referred to by means of chronostratigraphy: (i) the PIG refers to the last 19 ka years, i.e. a precessional cycle should be complete within the next 5 ka years; (ii) the LIG is the time span between 133 ka and 109 ka years, i.e. a time slot of 24 ka years, roughly a precessional cycle. The db compiles comprehensive selected palæo-data retrieved from a variety of sources (http://www.ncdc.noaa.gov, http://www.pangaea.de and others) but also instrumental data, to validate reconstructions against observations (e.g. http://data.giss.nasa.gov, http://iridl.ldeo.columbia.edu, etc). The records included accomplish two simple criteria: they cover the time span of interest, specifically the PIG and the LIG periods, and have sufficient time resolution to distinguish between an ACC and a gradual event.

The research has focussed on three main palæoarchives: (i) ice cores, because they have been the reference for ACCs for over half a century; (ii) stalagmites, because they are crucial for dating, particularly for the LIG; (iii) marine and continental sediments, because they have proven to be a powerful source of ACCs. The same response is not seen everywhere due to proxy and location effects (see-saws not only north-to-south between poles, but also tropics-to-poles and eastern-to-western gradients). However, by using global and regional stacks, PIG-like events have been located within the LIG period. The spatio-temporal pattern during several specific events will be discussed. For example, the results show that the PIG 8.2 ka-event was something akin to a dividing line, as it was a LIG event which occured at approximately 120 ka ago. Environment and climate were evidently very different before and after this type of events. Additionally, the 2.6 ka and 0.8 ka-events were more an exception than a rule, somewhat resembling a clear glacial inception initiated from 113 to 111 ka ago. However, ACCs within the PIG are not exactly the same as the ones for the LIG, either in intensity or rates of change. This fact is hardly surprising given that none of the triggers and sources of persistence were reproduced in an identical mode during both periods.