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Climate of the Past Discussions

Interactive comment on "Correlation of Greenland ice-core isotope profiles and the terrestrial record of the Alpine Rhine glacier for the period 32–15 ka" *by* M. G. G. De Jong et al.

Anonymous Referee #1

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This manuscript has a number of questionable aspects and does not address issues related with climate dynamics, but the application of spectral analysis methods to detect stratigraphic sections in Greenland ice cores and their coherency with discontinuous information on past changes in Rhine glacier. My recommendation is to reject this manuscript which does not meet the quality for Climate of the Past.

Major issues

- The mathematical framework developed to identify stratigraphic sequences is not convincing. A first issue lies in the signal to noise aspect. It would be more straightforward to (i) compare the d18O and dust records from the three investi-

gated Greenland ice cores and identify robust signals from regional noise, possibly using principal component methods, and (ii) discuss the changes in mean state and or variability by analyzing this common signal.

- The mathematical method relies on basic assumptions that may not be correct, such as (i) the hypothesis of periodic fluctuations, and (ii) the lack of sampling bias. As the authors may know, ice cores are sampled regularly in depth, which, because of thinning and changes in accumulation, results in an irregular age sampling. The impact of this change in resolution is not discussed. The method may also assume implicitely a certain type of data distribution; the dust record distribution for instance is not normal and this should be addressed. There is a confusion between the discussion of "climate oscillations" and results that may be side products of the use of the spectral analysis method which can generate spurious period signals. Moreover, several processes may alter the Greenland 18O record such as changes in moisture origin (as indicated by deuterium excess variations) (see for instance Jouzel et al QSR 2007 for a recent review, or Steffenson et al Science 2008 for higher resolution records of the last deglaciation), or changes in precipitation intermittency (e.g. Capron et al Clim Past 2010). These aspects deserve to be at least mentioned when applying complex mathematical methods to the 18O signals.

- The core of the manuscript is very descriptive about the different "stratigraphic periods" without any objective signal to noise and uncertainty discussion.

- The discussion is not satisfying. There are a number of mechanisms that can produce out of or different climate variations in Greenland and Europe, on a variety of time scales (e.g. NAO, AMO, changes in atmospheric circulation linked with reorganizations of AMOC, or linked with orbital forcing). The discussion of events related to one or another process or forcing is missing. The attribution of some events to orbital forcing appears totally subjective. Climate records

are available regionally (e.g. from pollen records or speleothems) and a comparison between Rhine glacier fluctuations and local climate variability may also make sense, for instance in order to characterize the main climate drivers (e.g. summer temperature, winter snow amounts) and the time scale of the glacier response to climate. The authors should formulate more explicitely the questions that they aim to address and take into account uncertainties in formulating their conclusions on these questions (e.g. synchroneity).

- Figures are too numerous and not synthetic enough. They are difficult to read. Tables must include key uncertainties (e.g. GICC05 dating uncertainty).

Interactive comment on Clim. Past Discuss., 7, 4335, 2011.