

## ***Interactive comment on “The Earth’s climate system recurrent & multi-scale lagged responses: empirical law, evidence, consequent solar explanation of recent CO<sub>2</sub> increases & preliminary analysis” by J. Sánchez-Sesma***

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This comment deals only with the atmospheric CO<sub>2</sub> data plotted in the discussion paper, an issue which - as far as I was able to follow - has not yet been brought up by the reviews published until today.

In Figures 9 and 10 CO<sub>2</sub> is plotted based on stomata-based reconstructions for the last 12,000 years (the Holocene) with zoom on the more recent period (last 2000 years) and is then compared with some calculated CO<sub>2</sub> values, which seemed to show similar variability.

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The chosen CO<sub>2</sub> proxy (stomata-based) is known to be a poor recorder of the small scale variability of CO<sub>2</sub> we seen during these rather stable time periods. They compare especially weak against ice core CO<sub>2</sub> data, which are still believed to be a recorder of ancient atmospheric concentrations. Several papers have discussed these discrepancies and weaknesses of the stomata-based CO<sub>2</sub> proxy in detail, (e.g. Ahn et al., 2014; Indermühle et al., 1999; Köhler et al., 2015).

Furthermore, it is well known and established, that the ice core CO<sub>2</sub> of the recent past (last 2000 years) from the Law Dome ice core, overlaps without any offset with the instrumental CO<sub>2</sub> measurements, which started in year 1958 in Manua Loa, Hawaii, giving firm evidence that ice cores indeed record atmospheric CO<sub>2</sub> without any significant offset (MacFarling-Meure et al., 2006; Rubino et al., 2013).

The knowledge on CO<sub>2</sub> variability over the last 2000 years has been extended by some CO<sub>2</sub> data from the West Antarctic Ice Sheet Divide ice core (Ahn et al., 2012; Bauska et al., 2015). In addition to the Law Dome data we now know that CO<sub>2</sub> varied between 270 and 285 ppmv during the last 2000 year, starting to rise due to anthropogenic emissions around year 1750 CE from 278 ppmv to nowadays around 400 ppmv. The variability of CO<sub>2</sub> between 270 to 390 based on stomata and plotted in Figure 10 is not supported at all by the more reliable ice core CO<sub>2</sub> data.

For the Holocene (last ~12,000 years) CO<sub>2</sub> variability is - again based on ice core data (Monnin et al., 2004; Elsig et al., 2009) - well established to be between 255 and 285 ppmv, consisting of a ~10 ppmv decrease between 11,000 and 8,000 years before present and a gradual rise thereafter. Non of that is found in the stomata-based CO<sub>2</sub> proxy record plotted in Figure 9.

These misfits of plotted CO<sub>2</sub> values (based on stomata CO<sub>2</sub> proxies) from ice core CO<sub>2</sub> are severe shortcomings of the study. If ignored, it would suggest, that our knowledge of CO<sub>2</sub> based on ice cores is wrong, for which no further support is given. For any further details on the difference of ice core based CO<sub>2</sub> and stomata-based CO<sub>2</sub> please

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refer to other papers discussing those in detail (Ahn et al., 2014; Indermühle et al., 1999; Köhler et al., 2015).

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