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High-resolution methane records covering the Holocene

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In order to better understand CH4 variations during the Holocene, we have developed an ultra-high resolution (20-30 year) CH4 record from the WAIS Divide core (79.467°S, 112.085°W). Preliminary results confirm previous Antarctic measurements with early Holocene CH4 values of 690ppb, dropping gradually to mid Holocene values of 565ppb and then climbing to early preanthropogenic values of ∼700ppb. The most striking feature of this ultra-high resolution record is the 8.2ka event that is well established in our record. At WAIS, CH4 values drop by 70ppb over ∼50 yrs at the start of the 8.2 ka event, before climbing gradually over the ensuing 60 years culminating in a rapid increase over the last 30 years of the record back to pre 8.2ka values (635 ppb). Our new record follows a similar record from the GISP II ice core in magnitude suggesting the interpolar CH4 gradient remained relatively constant throughout the event. This in turn suggests that the 8.2ka event was most likely a global CH4 event impacting tropical emissions.

Further insight into CH4 systematics during the Holocene was obtained using a revised version of the BOSCAGE 8-box atmospheric CH4 model. The model is broken into six 30o latitude bins and two stratospheric boxes for the N and S hemispheres. Mixing between the boxes, the latitudinal distribution of sources and sinks and the characteristic isotope values were fixed and maintained throughout the simulations based on present day inversion studies.