

Interactive comment on “Stable water isotopes and accumulation rates in the Union Glacier region, West Antarctica over the last 35 years” by Kirstin Hoffmann et al.

M. Frezzotti (Referee)

massimo.frezzotti@enea.it

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This manuscript provides a new stable records over the last 35 years of water isotope and snow accumulation from 6 firn cores of the Ellsworth Mountains area and ice rise on Filchner-Ronne Ice Shelf . The result of isotope and accumulation records are compared with re-analysis and large-scale modes of climate variability such as the Southern Annular Mode (SAM) and the El Niño–Southern Oscillation (ENSO) and sea ice extent.

The water isotope and snow accumulation records are very valuable because are representative of an area with very limited records. While I believe that this manuscript will

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make an important contribution for the characterisation of climatic history of this area, major comments should be addressed before its publication.

The title referred to Union Glacier is misleading, Ellsworth Mountains probably is more appropriate.

The firn cores where collected in a complex area of about 400 km² at the boundary between WAIS plateau (PASO-1), Mountain glacier (BAL-1, SCH-1/2), outlet glacier/blue ice area (GUPA-1) and Ice rise on Filchner-Ronne Ice Shelf (DOTT-1). The Authors must be describing the site cores from morphological and climatological of point view and taking well in account their location/characteristic during the interpretation of the data, not only elevation and distance from the open sea determine the snow fall intensity and relative isotope compositions.

The storms that provide snow precipitation could be “similar” for all 6 cores, but the orographic effect on precipitation and the post depositional effect could be very different, as the records shown. Significant wind drift occurs at AWS with mean wind speed of 6.9 m·s⁻¹, this agrees with the extensive presence of blue ice along Union Glacier, in particulate for GUPA-1. At this site probably the anthropogenic effect is limited respect to wind scouring. The transportation by suspension (drift snow) starts at velocities greater than 5 m s⁻¹ (within 2 m), and blowing snow (snow transportation higher than 2 m) starts at velocities of 7 m s⁻¹.

The authors compare the data without a clear analysis of the ratio between signal vs noise and their representativeness at local/regional scale (see ex RUPPER et al., 2015, Eisen et al., 2008) .

The Authors must be provide firstly evidence of a correlation with the ERA re-analysis with meteo station and/or core records before looking at large scale modes such as SAM or ENSO. The assumption of relationship between snow accumulation/isotope temperature with sea ice extent must be demonstrate in general. The d-excess is correlated to the moisture source region (sea ice) and distillation effect along the trajec-

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tory, instead the oxygen and deuterium rate are strictly correlated to snow precipitation temperature, their seasonality and frequency.

The Authors compares the result mainly with the coastal part of WAIS (Amundsen and Bellingshausen Sea) and AP, with very small attention to the closer Filchner-Ronne Ice Shelf (Berkner island ex.), WAIS inner site (Kaspari, et al., Burgener et al.,) and DML (Coats Land) with analogous moisture source area Weddell Sea.

The area is not a “coastal area”, open sea is around 1000 km far from Weddell Sea

Detail:

Introduction too long, without a clear finalization of the paper.

2.3 dating,

NO clear evidence of Pinatubo nssS signal in SCH-2 and PASO-1, value similar to other annual peaks (SCH-2) or much lower (PASO-1) .

How as been composed and which is the grade of confidence of the time series at annual scale if the error associated to ALC vary from 1 yr (2 cores) to 2 years (4 cores) and without taking in account the ratio of signal/noise due to sastrugi?

See Noise vs signal , 1985 snow accumulation at SCH-2 vs PASO-1 pag 7

Which is the cross correlation between the different cores for isotope and accumulation?

2.4 Which is the difference between the two AWS station? show both data in figure 4

Which threshold of snow precipitation is used from ERA Interim for HYSPLIT? Why the analysis is performed only 4 years from 2010 to 2014?

3.3 SCH-2/1 and BAL-1 are within 10 km and show similar accumulation, the comments about higher and lower accumulation should be addressed for these sites also at annual scale or better a pluriannual (eg. 3 years), to see the ratio signal/noise.

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SCH-2 is isotopic “less depleted” than SCH1 with 250 m of difference in elevation and BAL-1 at the same elevation, PASO1 presents a similar isotope mean with Bal1 with 400 m of difference in elevation. GUPA-1 is “more depleted” than SCH-1/SCH2 with a difference in elevation of 500-800 m. Before any consideration in discussion about the isotope and accumulation some comments must be addressed on these difference and their significant, also in comparison with the other core sites in different geographical position and much far.

4.1.2 Line17-21, Is ERA-Interim or the staked records that are not able to capture the Climate of Ellsworth Mountain? ERA-interim should be firstly compared with AWS data and than with firn records. Isotope and snow accumulation represent the snow fall events plus the noise due to post-deposition process, the absence of correlation with ERA-Interim must be better analysed also in comparison with AWS.

4.2.1

PASO-1 presents an accumulation from 37 to 27% less than SCH1/2 and BAL1.

No sense the average value of 0.25 weq a-1 and their comparison with other measurements at hundred km far.

Line 7-9 These data must be compared with the closer site of inner WAIS, Filchner-Ronne Ice Shelf and DML (Coats Land) instead of AP and Coastal Ellsworth Land with difference moisture source.

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