IASI carbon monoxide validation over the Arctic during POLARCAT spring and summer campaigns

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In this paper, we provide a detailed comparison between carbon monoxide (CO) data measured by the Infrared Atmospheric Soundin g Interferometer (IASI)/MetOp and aircraft observations over the Arctic. The CO measurements were obtained during North American (NA SA ARCTAS and NOAA ARCPAC) and European campaigns (POLARCAT-France, POLARCAT-GRACE and YAK-AEROSIB) as part of th e International Polar Year (IPY) POLARCAT activity in spring and summer 2008. During the campaigns different air masses were sampled i ncluding clean air, polluted plumes originating from anthropogenic sources in Europe, Asia and North America, and forest fire plumes origina ting from Siberia and Canada. The paper illustrates that CO-rich plumes following different transport pathways were well captured by the IA SI instrument, in particular due to the high spatial coverage of IASI. The comparison between IASI CO total columns, 0–5 km partial colum ns and profiles with collocated aircraft data was achieved by taking into account the different sensitivity and geometry of the sounding instru ments. A detailed analysis is provided and the agreement is discussed in terms of information content and surface properties at the location o f the observations. For profiles, the data were found to be in good agreement in spring with differences lower than 17%, whereas in summe r the difference can reach 20% for IASI profiles below 8 km for polluted cases. For total columns the correlation coefficients ranged fro m 0.15 to 0.74 (from 0.47 to 0.77 for partial columns) in spring and from 0.26 to 0.84 (from 0.66 to 0.88 for partial columns) in summe r. A better agreement is seen over the sea in spring (0.73 for total column and 0.78 for partial column) and over the land in summer (0.69 fo r total columns and 0.81 for partial columns). The IASI vertical sensitivity was better over land than over sea, and better over land than ove r sea ice and snow allowing a higher potential to detect CO vertical distribution during summer.

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