312

SNOW ACCUMULATION ALONG THE CHINESE ITASE TRAVERSE LINE FROM ANTARCTIC COAST TO DOME A: MEASUREMENTS FROM STAKES AND AUTOMATIC WEATHER STATIONS

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Surface snow accumulation along the Chinese ITASE traverse line was measured using bamboo stakes. Stakes along the initial (coastal) 300 km of the line were installed in 1997. The stake network was extended to 465 km in 1998, to 1100 km in 1999 and finally to 1228 km (from the coast to Dome A) in 2005. Measurements on these stakes provide data on the spatial distribution of the snow accumulation rate from the coast to the summit of the East Antarctic ice sheet. More detailed accumulation rate measurements are available from arrays of 36 stakes in a 6×6 matrix over a 100 m ×100 m area. Such arrays were deployed at five sites: LGB69 (160 km from the coast), DT008 (310 km), DT217 (728 km), DT364 (1022 km) and DT401 (1097 km). Snow accumulation measurements were also made with ultrasonic sensors mounted on automatic weather stations (AWSs) installed at LGB69, Eagle (DT364) and Dome A. More than four-years of surface snow height (SSH) data are available for LGB69, and more than one-year for Eagle and Dome A. The AWS data provide not only net accumulation at the sites, but also information on accumulation events and the processes of firnification and wind-redistribution of snow.

The stake results show a high accumulation rate in the coastal 200 km (>50 cm snow/a), a relatively constant accumulation between 200 and 400 km (~30 cm snow /a), and a decline between 400-500 km, where the lowest accumulation rate along the line is found (~0 cm snow/a). There is then a steady increase from 500 to 800 km (0 to ~15 cm/a), followed by a decrease as both altitude and distance from the coast increase.

The stake array at LGB69 had a mean annual snow accumulation between 1999 and 2001 of 75 cm/a (it was buried by the time of the 2005 traverse). The other arrays results give mean annual accumulation rates between 1999 and 2005 of 32.8cm/a at DT008, 2.9 cm/a at DT217, 14.6cm/a at DT263 and 6.3cm at DT401.

The SSH data at LGB69 show snow accumulation of approximately 70 cm/a, with episodic increases of SSH 4-5 time per year. These episodic events coincided with obvious humidity “pulses” and decrease of incoming solar radiation as recorded by the AWS. The SSH change at Dome A over 2005 was about 11 cm and at Eagle it was about 28 cm. However, longer SSH observations are needed at Dome A and Eagle to determine more precise accumulation rate there.