Fieldwork Highlights 2005/06

AFI4/09: Improving ice-core interpretation: the role of storm-track changes on sub-annual Peninsula precipitation variability

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This project is concerned with understanding how air mass origin and meteorology affect the mass accumulation of areas of the Antarctic Peninsula, and how the atmosphere's properties are preserved in the snow. The fieldwork component of this project involved obtaining ground truth measurements in the form of ice cores at three sites along the Western Peninsula, where automatic weather stations had been deployed in the previous season (Fig. 1).

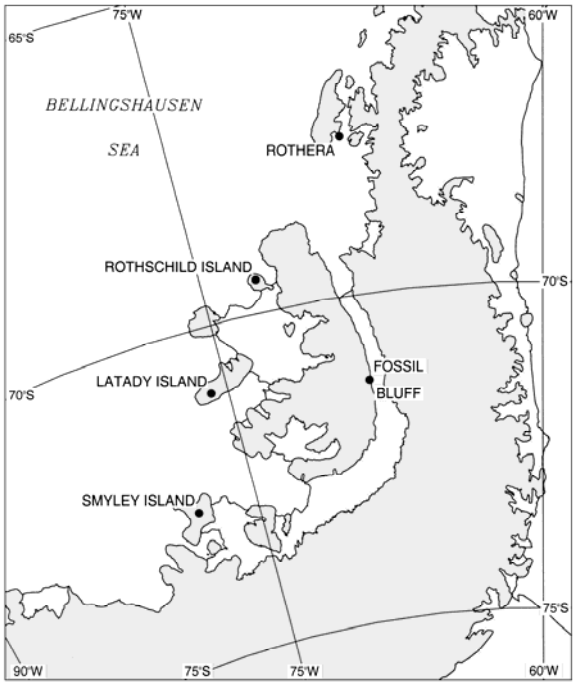

Figure 1. Location of the three field-sites and BAS research stations utilised during instrument deployment.

The first site visited was Rothschild Island, in a col between two small mountain ranges. Upon arrival it became apparent that an unprecedented amount of snowfall had buried the AWS, and it could not be located. Overnight, two shallow cores were drilled and excavate a snow pit excavated at the approximate position of the AWS, on 29/01/06. The following day the field party were uplifted to the second site, Latady Island. The drill site was situated at the summit of the central rise and the top 60cm of the 5m AWS was still protruding above the surface (Figure 2). Again, this was an unprecedented amount of accumulation for this region according to re-analysis, forecast models and previously collected ice cores from the island.

Figure 2. AWS at Latady Island before and after one year's accumulation

As the surface around the anemometers could not be disturbed until the cores had been drilled beneath, the AWS had to be dug out by digging a diagonally descending trench taking 21 hours. Drilling during the daytime of 30/01/06 proved to be challenging, as the warm air in the hole and around the bit after extraction caused it to heat, melt snow on it, then re-freeze quickly when re-inserted. On occasion this caused the teeth on the drill bit that grasps the core to freeze in the open position. Lessons were learned and techniques improvised to minimize the effects of this, but this resulted in the first core being somewhat shorter than anticipated.

Figure 3. Ice coring and AWS extraction from Latady Island

The second core was drilled over night in far cooler conditions, and was extremely successful (Fig. 3). On the second day the weather was sufficiently clear to uplift to Fossil Bluff, and await a weather window for Smyley Island, the last site drill site. The island was eventually reached on 11/02/06 after harbouring at Sky Blue depot. Drilling conditions were fierce with 30 knot blowing snow and poor visibility. The site AWS was not

recovered, and deemed buried. As with Rothschild Island, two cores of 8 and 12m length were obtained from its approximate position, in addition to the sampling of a snow pit.

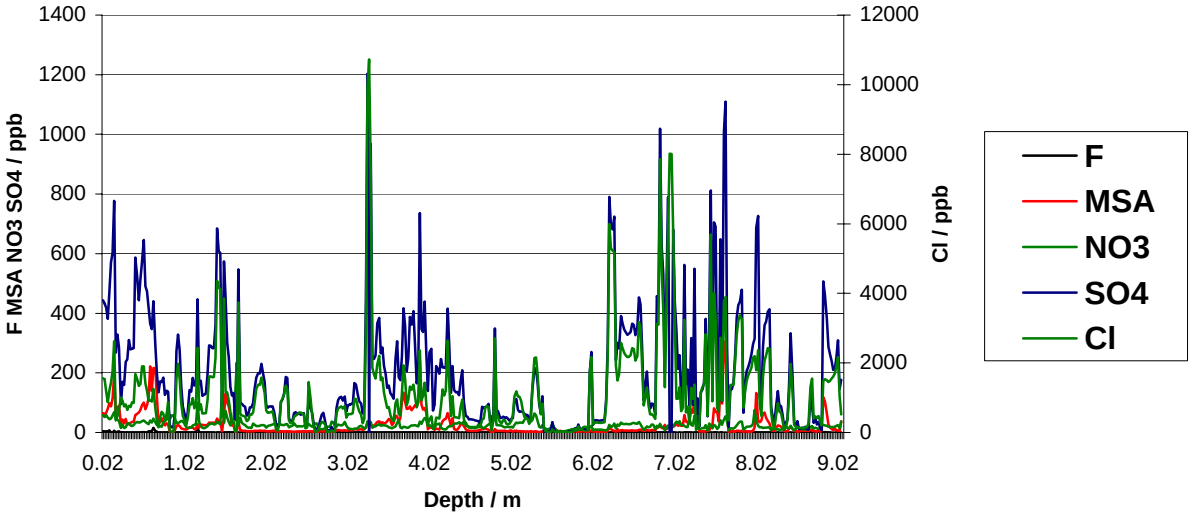

Fig. 4 Initial ion chemistry analysis of Latady ice core revealed two years of accumulation in first 8m.

Initial analysis undertaken at BAS (Fig. 4) indicates that the cores obtained have remained cohesive, particularly those drilled from Latady Island where the AWS data were retrieved (Fig. 5), and will provide the necessary data for the project.

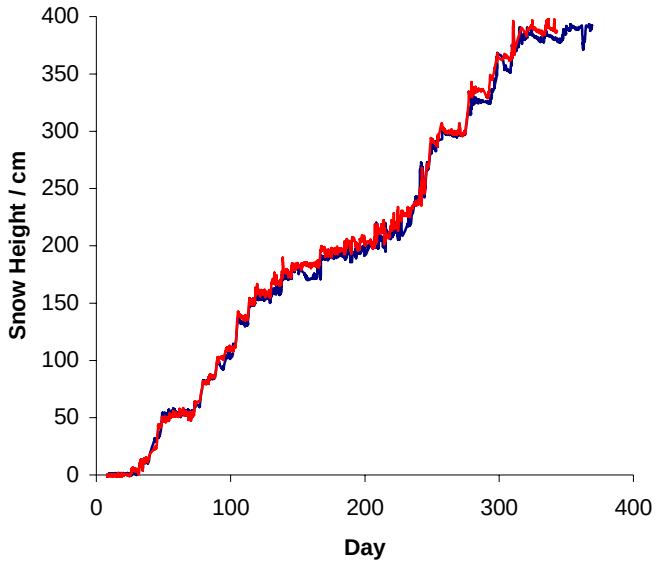

Figure 5 Sonic height sensor on AWS at Latady recorded accumulation for one year at the site.

Despite the loss of two of the three AWS, due to unprecedented accumulation in the region, sufficient data have been recovered—the six ice cores obtained during the field season and the accumulation data from the Latady Island AWS — to enable the project to be completed successfully.