Séminaire LGGE

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sallle L. LLiboutry, LGGE

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The impact of föhn winds on regional climate and surface melt over the Larsen Ice Shelf, Antarctica

Over the past 50 years, the Antarctic Peninsula has been one of the most rapidly warming regions on Earth. Associated with this warming, there have been major changes in the regional cryosphere. Most notably, some of the ice shelves fringing the eastern coast of the Antarctic Peninsula have retreated rapidly and, in some case, disappeared entirely. While basal melting may play a role in controlling the viability of some ice shelves, such as those in the Amundsen Sea sector of Antarctica, it is generally believed that the major driver of ice shelf retreat in the eastern Antarctic Peninsula is the increased surface melt associated with rising near-surface air temperatures during the melt season

Analysis of limited temperature records from the east coast of the Peninsula shows that summer warming trends here are around three times as large as those on the west coast. Furthermore, summer temperatures on the east coast correlate strongly with the strength of the circumpolar westerly winds. This suggests a hypothesis that the rapid summer warming and increased melt over the east Peninsula ice shelves has been caused by an increased frequency of föhn winds downwind of the Peninsula mountains, associated with a strengthening of the circumpolar westerlies.

In January 2011 a major field campaign, “Orographic Flows and the Climate of the Antarctic Peninsula” (OFCAP) was undertaken to study föhn winds and their impact on the Larsen Ice Shelf. Measurements included the deployment of a chain of automatic weather stations, flights with an instrumented aircraft and surface energy balance measurements from a camp on the Larsen Ice Shelf. In this talk I will present observations of the structure of föhn winds made during this campaign. I will also show how data from high-resolution atmospheric models can be used to study the impact of föhn on surface energy balance and surface melt over the ice shelf.