

## PROJECT SUMMARY

The U.S. ice core research community is proposing a deep ice coring program in West Antarctica to develop a unique series of interrelated climate, ice dynamics, and biologic records focused on understanding interactions among global earth systems. This program will collect a deep ice core from the West Antarctic ice sheet (WAIS) ice flow divide and integrate approximately 15 separate but synergistic projects to analyze the ice and interpret the records. This proposal requests funds to collect the core and establish a Science Coordination Office to facilitate the program.

**SCIENTIFIC MERIT:** The most significant characteristic of the WAIS Divide program will be development of climate records with an absolute, annual-layer-counted chronology for the most recent ~40,000 years. Lower temporal resolution records will extend to ~100,000 years before present. These records will enable comparison of environmental conditions between the northern and southern hemispheres and study of greenhouse gas concentrations in the paleo-atmosphere with a greater level of detail than previously possible. The WAIS Divide core will provide the best material that can be recovered from any location—with unprecedented time resolution—to investigate the main science themes of the program:

- (1) **Climate forcing by greenhouse gases:** This program will provide a record of greenhouse gases with unprecedented time resolution during the rapid climate changes that occurred at the end of the last glacial period. The relative timing of changes in greenhouse gases and other environmental parameters will be determined.
- (2) **Role of Antarctica in abrupt climate change:** This program will develop high-time-resolution records that can be used to infer the interaction of the southern oceans and atmosphere with each other and with their northern counterparts. This will allow precise investigation of the role of the Antarctic in abrupt climate changes.
- (3) **Relationship among northern, tropical, and southern climates:** Small differences in the age of the ice versus the age of the gas in the ice will allow investigation of the relative timing of Northern Hemisphere Dansgaard-Oeschger events and corresponding Southern Hemisphere climate excursions.
- (4) **Stability of the West Antarctic ice sheet:** This program will determine how the West Antarctic ice sheet responded to previous climate changes, which will improve predictions of how the West Antarctic ice sheet and sea level will respond to current and future climate changes.
- (5) **Biological signals in deep ice cores:** Investigations of biological material in deep ice will yield information about biogeochemical processes that control and are controlled by climate as well as lead to fundamental new insights about life on earth.

**BROADER IMPACTS:** Broader impacts of this proposal include the following:

- 1) Providing overall scientific direction, support, and integration for approximately 15 of the science projects that are proposed separately.
- 2) Addressing major science questions of interest to the climate, ice dynamics, and biology communities.
- 3) Explaining climate, glaciology, and biology issues to a broad audience through mass media.
- 4) Training the next generation of investigators in ice core research.
- 5) Involving a diverse group of students in climate, glaciology, and biology investigations.