

# Lamont Scientists & Engineers Use Technology & Geophysics to monitor changing polar ice sheets from the air!



Lamont scientists and engineers use Airborne Geophysics to better understand the polar regions. The poles are changing rapidly and these changes are connected to the rest of the Earth. We need to 'see' under the ice to understand why these changes are occurring. Radar, magnetics, gravity, laser and infrared measurements are helping us to understand the processes.



**Twin Otter Aircraft used in the AGAP Project 2008/2009 East Antarctica Altitude 25,000 ft. - Payload 5000 lbs.**

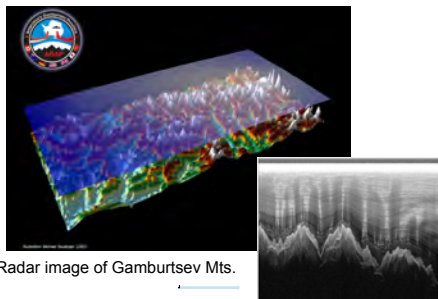


**LC130 Hercules transport plane used as part of the Ice Pod project in both poles.**  
Altitude 30,000 ft. - Payload 30,000 lbs.



**P3 Orion used as part of the Ice Bridge program with NASA**  
Altitude 30,000 ft. - Payload 14,700 lbs.

The AGAP project used geophysics to locate a ~8500 ft. mountain range in East Antarctica under ice up to 2 miles thick. An early composite of the mountain range (below) allows us to 'see' through the ice to a landscape long hidden by an ice sheet.

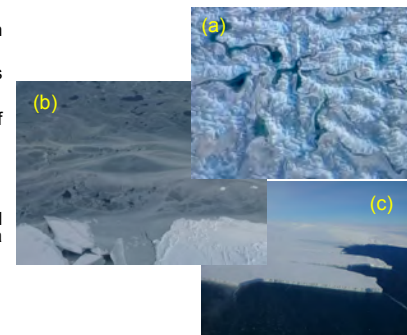


Radar image of Gamburtsev Mts.

## INSTRUMENTS USED TO MONITOR THE ICE

- **LASERS** measure ice surface elevation & surface roughness
- **INFRA-RED & VISIBLE WAVE CAMERA** measure heat loss or gain in the ice sheet and velocities
- **RADAR** measures through the ice for ice-thickness, internal ice layers and down to the bedrock for bed roughness
- **GRAVITY** measures Earth density through the ice, revealing the size of subglacial waterbodies
- **MAGNETICS** detects the Earth composition/materials under the ice
- **GPS** precisely locates the aircraft on the Earth's surface
- **IMU** calculates current position based on rate of acceleration and changes in rotation, important for connecting the collected data to a specific location.

The Ice Bridge project outfits a P3 Orion with instruments to monitor ice in the polar regions. (a) Ice melt pools on the Greenland surface, (b) shrinking sea ice cover and (c) calving & melting ice shelves.



Tim Creyts, Kirsty Tinto & Jim Cochran, Indrani Das participate in Operation IceBridge monitoring the cryosphere (ice regions of the Earth), Nick Frearson, Robin Bell, Adrienne Block, Beth Burton participate in AGAP project imaging the hidden mountain range in East Antarctica, LingLing Dong plans for the Ice Pod project to monitor the changing icesheets.

