

SEARCH FOR METEORITES IN THE PATRIOT HILLS AREA, ELLSWORTH MOUNTAINS, WEST ANTARCTICA. P. Lee¹, W. A. Cassidy², D. Apostolopoulos³, M. Deans³, A. Foessel³, C. Krause⁴, J. Parra⁵, L. Pedersen³, K. Schwehr¹, R. P. Harvey⁶, and W. L. Whittaker³. ¹NASA Ames Research Center, MS 245-3, Moffett Field, CA 94035-1000, USA, ²Dept. of Geology and Planetary Science, Univ. of Pittsburgh, Pittsburgh, PA 15260, USA, ³The Robotics Institute, Carnegie Mellon Univ., ⁴Fuerza Aerea Chilena, ⁵Instituto Antartico Chileno, ⁶Case Western Reserve Univ.

Introduction: A (human) search for meteorites was conducted in the Patriot Hills area (80°20'S, 81°20'W), Ellsworth Mountains, West Antarctica, between 30 Dec, 1997 and 25 Jan, 1998 as part of a site characterization study for the Robotic Antarctic Meteorite Search (RAMS) Project. The goal of the RAMS Project of the Robotics Institute of Carnegie Mellon University is to develop a robotic vehicle, the NOMAD rover, capable of searching for meteorites in Antarctica autonomously. The Patriot Hills site was chosen because of its relative ease and economy of access and because of its established geologic diversity [1]. A program of field tests of components and instruments to be integrated onto NOMAD in late 1998 was carried out at the Patriot Hills during the 97-98 field season in conjunction with the search for meteorites reported here.

Meteorite Search: The areas searched include both blue ice fields and moraines. The blue ice fields of Patriot Hills and nearby Independence Hills, Morris Cliff, Marble Hills, out to Minaret Peak (Minaret Bowl) were accessed, traversed, and searched for meteorites by snowmobile and/or on foot. Two additional blue ice fields above Morris Cliff and between Mt. Simmons and Mt. Geissel in the Independence Hills were accessed by light aircraft and searched on foot. A total blue ice area of approximately 60 km² was covered, representing the bulk of the blue ice area available between Mt. Shattuck, Patriot Hills, and Minaret Peak. The polymict, allochthonous portions of the moraines associated with Patriot Hills, Independence Hills (Independence Moraine), Morris Cliff, Marble Hills, and Minaret Bowl were also searched. The total linear distance of moraine walked was approximately 35 km.

Result: No meteorite was found. Several non-exclusive explanations for this outcome are possible: (a) The relatively low altitude

of the blue ice fields in the Patriot Hills area (800-1100 m vs >2000 m for typical meteorite concentration sites [2]) make for relatively warm summer peak temperatures and hence frequent seasonal melting of the surface ice. Meteorites exposed at Patriot Hills would be subject to rapid weathering and/or would not be able to be exposed at the surface without sinking deeper into the ice by radiative melting; cryoconite holes, melt ponds, and refrozen ice are pervasive features in the area and attest to the significance of this temperature effect. (b) The past and present directions of ice flow and associated discharges in the Patriot Hills area are poorly known, making unclear whether and where meteorite concentrations might be found. Several blue ice fields searched (e.g., along Independence Hills and Morris Cliff) were interpreted as having once received a greater influx of material from the Hollick-Kenyon Plateau, suggesting that any meteorite concentration process might have evolved through time. (c) The abundant presence of dark grey terrestrial rocks in the area (mostly the dark member in the marble of the Minaret Formation) would make smaller meteorites difficult to distinguish. None of these explanations can be ruled out at present. However, regardless of the reason, it can be safely concluded that the Patriot Hills are not a productive search area for meteorites. To date, no meteorite has been reported from West Antarctica.

References: [1] Craddock, C. et al. (1986) *Geologic Map of the Ellsworth Mountains* (1:250 000), GSA. [2] Cassidy, W. A. (1991). In *The Geology of Antarctica*, Oxford Univ. Press, 652-666.