

The Natural Thermoluminescence Survey of Antarctic Meteorites: Ordinary Chondrites at the Grosvenor Mountains, MacAlpine Hills, Pecora Escarpment and Queen Alexandra Range, and New Data for the Elephant Moraine, Ice Fields

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Abstract

The natural TL survey of Antarctic meteorites was started in 1987 at the request of the Antarctic Meteorite Working Group in order to provide an initial description of radiation and thermal histories. It was intended to be a complement to the mineralogical and petrographic surveys performed at the Johnson Space Center and the Smithsonian Institution. All ANSMET samples recovered since then, besides those that were heated throughout by atmospheric passage, have been measured. To date this amounts to about 1200 samples. As the data for each ice field reaches a significant level, we have been conducting a thorough examination of the data for that field with a view to (1) identifying pairing, (2) providing an estimate of terrestrial age and residence time on the ice surface, (3) looking for differences in natural TL between ice fields, (4) looking for variations in natural TL level with location on the ice, (5) looking for meteorites with natural TL levels outside the normal range. Pairing is a necessary first step in ensuring the most productive use of the collection, while geographical variations could perhaps provide clues to concentration mechanisms. Samples with natural TL values outside the normal range are usually inferred to have had either small perihelia or recent changes in orbital elements. In addition, induced TL data have enabled us to (5) look for evidence for secular variation in the nature of the flux of meteorites to Earth, and (6) look for petrologically unusual meteorites, such as particularly primitive ordinary chondrites, heavily shocked meteorites, or otherwise anomalous meteorites. To date we have published studies of the TL properties of 167 ordinary chondrites from Allan Hills, 107 from Elephant Moraine and 302 from Lewis Cliff and we have discussed the TL properties of fifteen H chondrites collected at the Allan Hills by Euromet after a storm during the 1988 season. We now have additional databases for a reasonable number of ordinary chondrites from Grosvenor Mountains (39 meteorites), MacAlpine Hills (70 meteorites), Pecora Escarpment (60 meteorites), and Queen Alexandra Range (173 meteorites) and we have data for a further 101 samples from Elephant Moraine. The results are summarized in Table 1. We also have fairly minimal databases (10-15 meteorites) for Dominion Range, Graves Nunataks, Reckling Peak and Wisconsin Range that will not be discussed here.