the southern L-ISCT) and Birkeland (82 km in diameter, the northern L-ISCT), but the locally elevated thorium may or may not be related to these impact features (Blewett et al., 2000; Garrick-Bethell and Zuber, 2005). If only one of these similar L-ISCT areas can be targeted by an instrument team, we suggest the northern target near the crater Birkeland.

Outstanding science questions include: What is the cause of the anomalous concentration of radiogenic elements in these areas? Could these local anomalies result from an asymmetry of lower crustal or upper mantle material excavated by SPA? Or could the material represent Th-rich ejecta converging at the antipode of the Imbrium or Serenitatis basin (Haskin, 1998; Wieczorek and Zuber, 2001)? How are these localized anomalies related the nature of the interior of this huge basin itself?

3.5. L-ISCT #5 Tycho crater

Target center: 43.3°S, 348.8°E

Principal rationale: Tycho is a large young crater on the nearside with an extensive ray system and a prominent dark halo of impact melt surrounding the crater. It is easily found with binoculars and sometimes can be seen by the naked eye during a full Moon.

Tycho crater, located in the south central portion of the nearside of the Moon is one of the most prominent features on the Moon as seen form Earth. A full Moon image of the southern nearside is shown in Fig. 9. Tycho exhibits a dark halo around its rim, produced by the emplacement of impact melt at the time of the crater's formation. Tycho's huge, bright ray system extends for thousands of km across the lunar surface. The rays are produced by ejecta that was excavated from the 84 km diameter crater and transported radially away from the crater, excavating, and mixing with local material when redeposited on the surface. Tycho is thought to have formed ~100 million years ago (Drozd et al., 1977). This age is derived from an exposure age date from the Apollo 17 site, where ejecta from Tycho (some 2000 km away) is thought to have modified the area around the landing site (Lucchita, 1977).

Shown in Fig. 10 is a Clementine 750 nm albedo image centered on Tycho and its surroundings. Tycho is characterized by a very fresh interior and rim deposit. The crater also has a prominent central peak and rough impact melt deposits covering the crater interior. In contrast to the surrounding feldspathic highlands, spectra from across the entire crater exhibit prominent mineral absorption bands due to the presence of high-Ca pyroxene (Pieters, 1993; Tompkins et al., 1999), suggesting that Tycho might have impacted into and excavated material from a lunar crustal pluton. Tycho is an excellent site for the study of fresh highland craters. Its prominence on the lunar nearside offers the opportunity for all viewers on Earth to connect to and recognize science targets on the Moon by observing the crater with the naked eye or with binoculars and small telescopes.

3.6. L-ISCT #6 Polar Region with shadows

Target center: 84°S, 118°E

Principal rationale: This area contains deep shadows and is located 6° from the South Pole. It is centered on the 28 km crater Idel'son L. This region does *not* exhibit high H abundance based on the Lunar Prospector results (Feldman et al., 2001; Lawrence et al., 2006) and thus provides neutron/gamma-ray background reference for H measurements at the pole. The area provides several calibration objectives for other instruments: light scattering (optical sensors), strong relief variations (altimetry, stereo), characterization of the interior of deeply shadowed areas (multiple sensors).

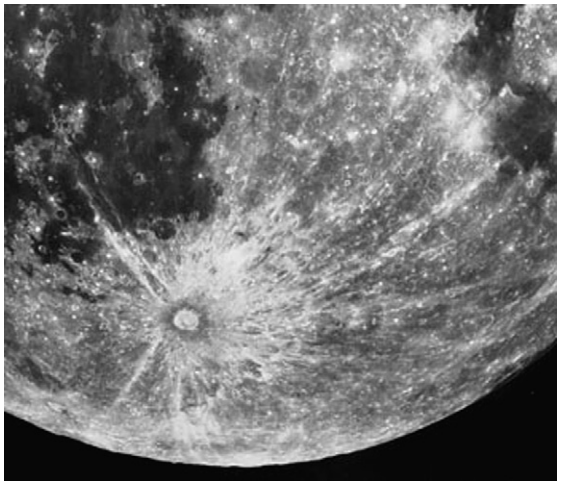

Fig. 9. Full Moon image of the crater Tycho showing its extensive ray system and dark halo.

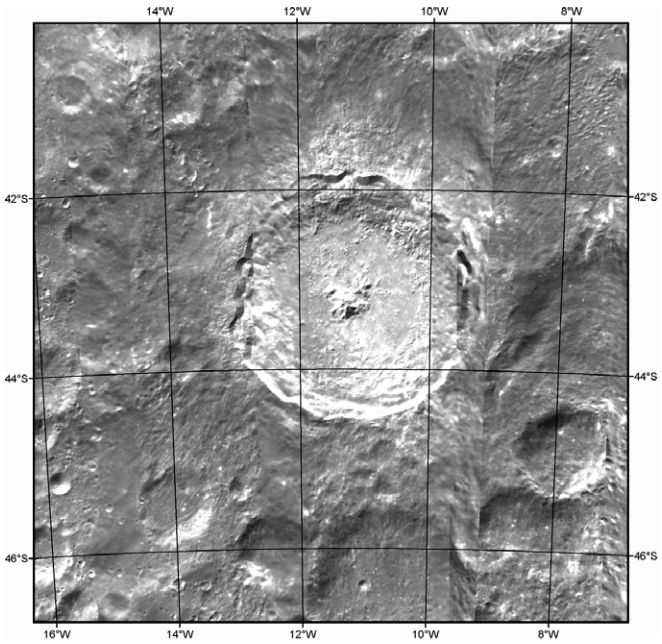

Fig. 10. Clementine 750 nm albedo image for the crater Tycho.