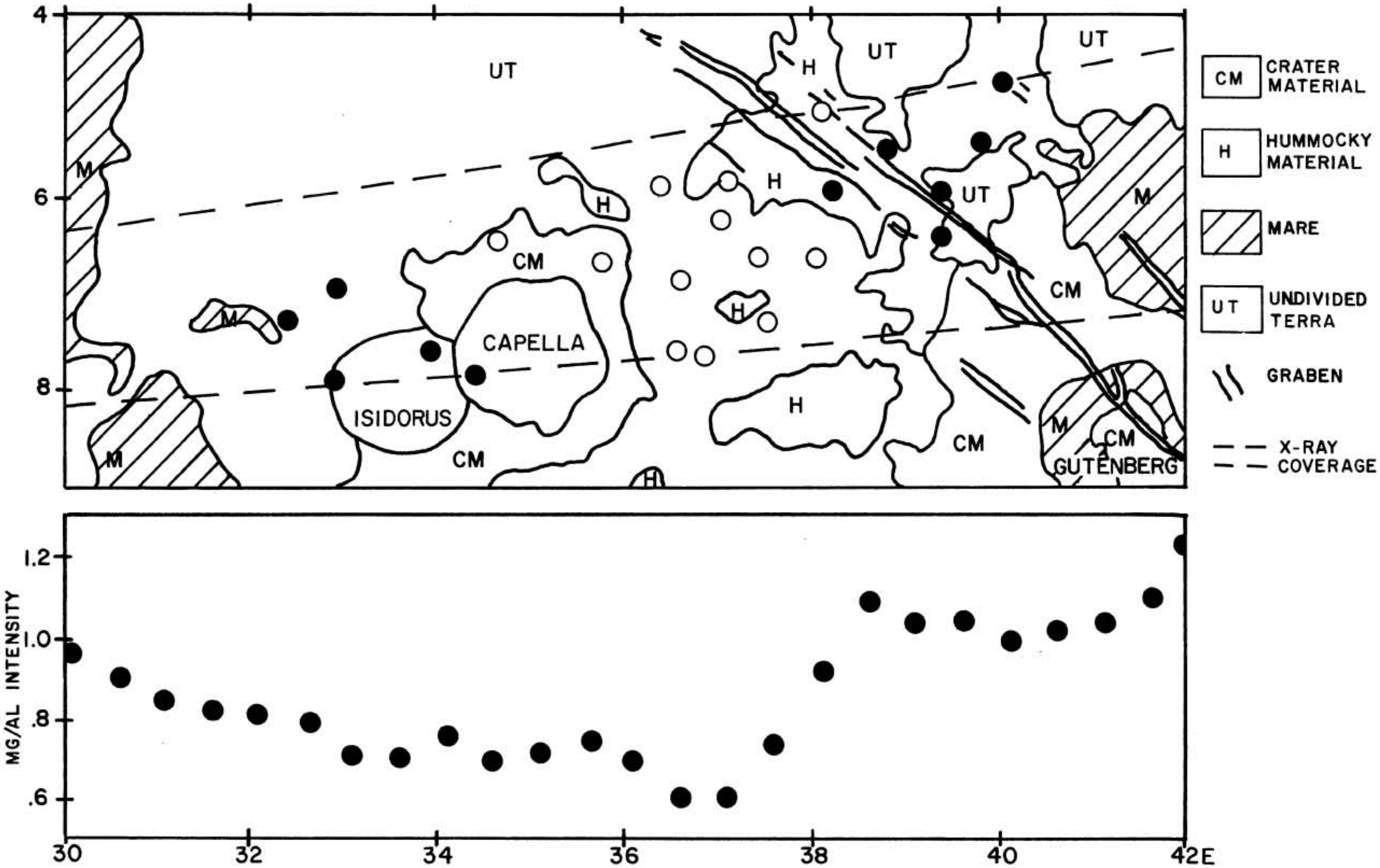
ADDITIONAL EVIDENCE OF LUNAR TERRA VOLCANISM. C.G. Andre and P.L. Strain, National Air and Space Museum, Washington, DC 20560; and W.J. Dove, University of Maryland, College Park, MD 20742.

Analysis of chemical variations in terra regions within orbital X-ray coverage of the Moon suggests that the nearside terra has been extensively "resurfaced". The chemical contrast between the highly anorthositic farside terra and the more mafic nearside terra is evident in remote X-ray and gamma-ray measurements of Mg, Al, Fe, Th and Ti concentrations at the lunar surface. However, nearside subsurface material that has been uplifted or excavated, e. g., the Kant Plateau (1), Langrenus crater ejecta, and the rim material surrounding the Smythii basin (2), exhibit strong chemical similarities to the less contaminated farside highlands. Terra volcanism is one possible mechanism for altering the chemical composition of the nearside surface. Before Apollo 16 samples were analyzed, early terra volcanism was commonly suggested as a reasonable explanation for many morphologic and spectral features. Since the discovery that there was no petrographic evidence of a volcanic origin for the light plains unit at that site, exogenic rather than endogenic interpretations are commonly ascribed to terra units. On the other hand, recent investigations of lunar light plains material using the orbital X-ray data strongly imply a volcanic origin for those units that have unusually high Mg/Si concentrations relative to the surrounding terrain. That is, distinct chemical anomalies reduce the likelihood that the units are comprised of local ejecta or ejecta from a common distant source (3).

The terra triangle north of Mare Nectaris, between Maria Tranquillitatis and Fecunditatis contains diverse rock types (Fig. 1). Mg/Al, Al/Si and Mg/Si ratios northeast of Capella crater indicate compositions nearly as anorthositic as the Kant Plateau and the eastern far side; but, between 37.5E and 38.5E, the Mg/Al ratio increases 75%. This Mg/Al concentration is only 21% less than that for mare basalts in central Fecunditatis. The highest (solid circle) and lowest (open circle) Mg/Al value for each orbit within the terra are shown in Fig. 1. The profile below the map shows the continuous variations along the groundtracks of the northernmost orbits. (The southernmost orbits that create the highest Mg/Al points west of Capella do not show a significant increase over the central terra values.) Errors are minimal because 9 data points comprise each point on the profile. This high Mg/Al anomaly corresponds to a hummocky terra unit characterized by multiple subparallel graben that extend hundreds of kilometers across both terra and mare. The graben trend NW/SE in the direction of the lunar grid and are radial to the Imbrium basin. The unit is clearly atypical of the rest of the terra surface. The calculated MgO wt. % is as high as 9.27 and the Al_2O_3 wt. % is as low as 19.4. FeO and TiO_2 values from gamma-ray data (4) are 10.5 and 3.5 respectively. Interestingly, on the basis of these elements, the composition is intermediate between the (somewhat arbitrary) designations for dark mafic basalt flows and highland basalt (5). The unit occupies a topographic low and its association with crustal fractures that are probably deep-seated as well as the distinctly more mafic chemical signature indicate a volcanic resurfacing of the anorthositic terra material in this region. Further investigation of units such as this one may reveal additional reasons to believe that pre-mare volcanism is a major contributor to the chemical dichotomy between the nearside and farside terra provinces.

References: (1) Andre C.G. and El-Baz F. (1981) Proc. Lunar Planet. Sci. Conf. 12th (in press); (2) Andre C.G. (1981) Multi-ring Basins, p. 125-132. (3) Maxwell T.A. and Andre C.G. (1981) Proc. Lunar Planet. Sci. Conf. 12th (in press); (4) Davis P.A. (1980) JGR 85, p. 3209-3224; (5) In Basaltic volcanism on the terrestrial planets (1981).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