EVIDENCE FOR EARLY VOLCANISM IN MARE SMYTHII James Conca, Lunar and Planet. Inst, Houston, TX 77058 and Brown Univ., Providence, RI 02912 and Norman Hubbard, NASA Johnson Space Center, Houston, TX 77058.

Mare Smythii is situated at the eastern limb of the moon and is one of the older lunar basins, certainly formed prior to the Crisium basin (1). Its interior is partially filled with mare material, which is underlain by an earlier unit that is topographically similar to other plains forming units around Crisium (2). We have investigated the origin of this early fill using recently improved orbital x-ray data (3) collected during Apollo 15. We find that this early unit has a terra composition that is more magnesian and less aluminous than that of the surrounding terra units (Figures 1 and 2 and Table 1). The large squares used to show some of the orbital x-ray data are equal to the one sigma error estimate on these data points. The Smythii early fill point carefully excludes the areas where low albedo material, presumably of mare basalt composition, is present. The conversion to Al_2O_3 and MgO concentrations has been done using an empirical ground truthing procedure (4). The observation that this early fill has a chemical composition that is restricted to the Smythii basin indicates that the composition of this unit is intimately related to the Smythii basin. Specifically, we propose that this is an early basaltic fill that has been mixed with local terra material to produce the observed aluminium and magnesium concentrations. In Figure 2 we show a mixing line and a point (X) that will produce the observed aluminium and magnesium concentrations if the material X is mixed 50/50 with terra west material. The actual mixture could be quite different from this but, almost nothing can be said from present data about the proportions mixed. However, we can say that this early basaltic material is not mare basalt because the mare basalt compositions such as seen in Smythii, or any other mare, do not have the required compositions(Figure 2). Non mare compositions such as those represented by 78235 (5) or the Very High Aluminium Basaltic composition (6) are illustrative of the types of volcanic material that we propose to be present because they plot along the extension of the mixing line. The aluminium and magnesium concentrations of these early volcanics can only be specified as having values that plot within about $\pm$ 2.0 wt % of the mixing line and with lower aluminium values than obtained for the early fill as it is observed from orbit.

In Figure 3 we have sketched a cross section of Mare Smythii showing our working hypothesis about the relationship of the early volcanic material to other materials in Mare Smythii.

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Table 1. Orbital x-ray data for Mare Smythii and surrounding terra, as shown in Figure 1.

Unit	N	wt % Al_2O_3	wt % MgO
Mare fill	45	15.4	10.7
Early fill	44	24.4	11.0
Terra west	423	27.8	7.9
Terra south	134	28.3	5.4
Terra east	217	31.8	5.7

N = number of 8 sec. data points averaged.

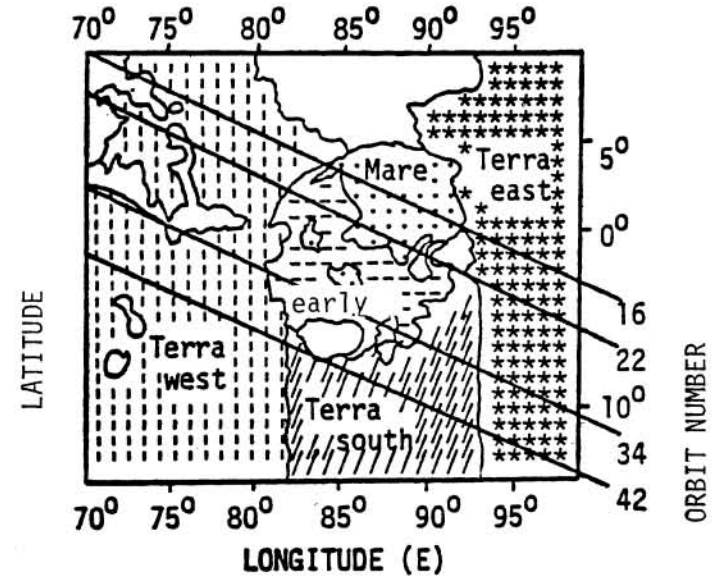

Figure 1. Sketch of the Mare Smythii basin and environs. See Table 1. for chemical data. Mare = mare fill and early = early fill.

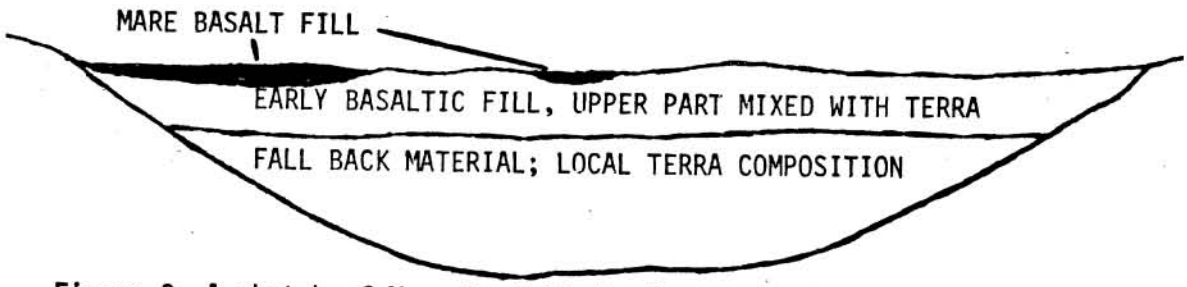

Figure 3. A sketch of Mare Smythii showing our working hypothesis about the relationship of the early volcanic material to other materials in Mare Smythii. Vertical exaggeration is about 10X.

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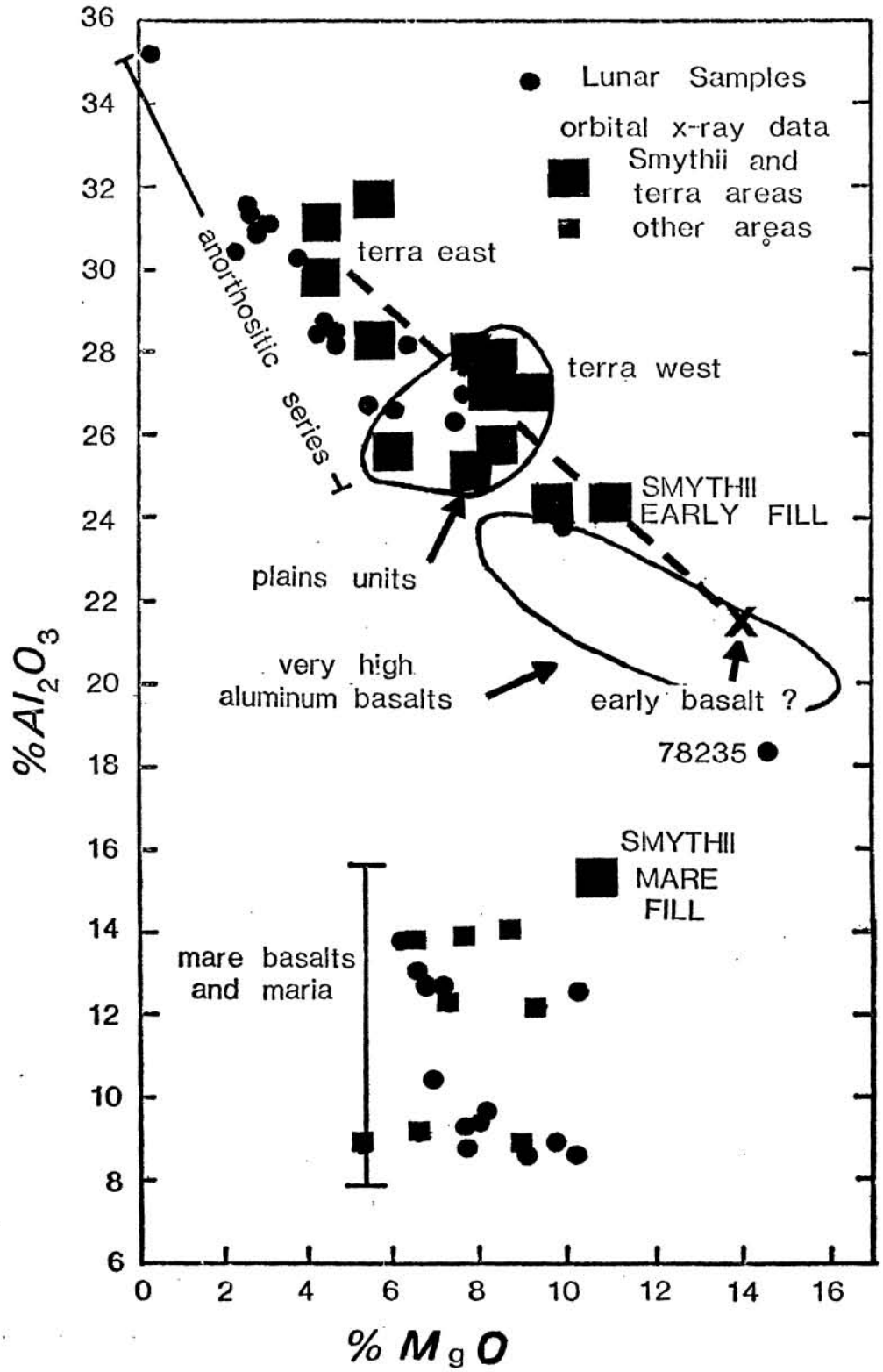

Figure 2. Orbital x-ray and lunar sample for diverse areas of the moon.