A Lunar Dome and associated Pyroclastic deposits north-east of the crater Schroter. R. Lena[1] and Barry Fitz-Gerald[2]- Geologic Lunar Research (GLR) Group. [1]Via Cartesio 144, sc. D, 00137 Rome, Italy; r.lena@sanita.it ; [2] 79 South Court Ave, Dorchester, Dorset, DT12DA United Kingdom barryfitz_gerald@hotmail.com

Introduction: To the north-east of the crater Schroter and north of Mosting E is an oval area of mare approximately 70 km on an east-west axis and 100 along a north-south axis. This was mapped as being mostly Procellarum Group mare material overlain in places by darker pyroclastic materials and is bounded to the west by a more rugged terrain mapped as belonging to the Caley Formation [1]. This area appears to be related to the eastern *Sinus Aestuum II Dark Mantle Deposit (DMD)*, reported in [2]. This feature is however smoother less rugged surface sets it apart from this more extensive *Sinus Aestuum II* DMD. In this contribution we describe a large volcanic dome and associated lunar pyroclastic deposits located at 3.43° N and 5.10° W (Figs. 1a-1b).

Morphometric properties: The dome, termed Sc1, has a base diameter of 35 km. Its height, determined using GLD100 dataset [3], amounts to 200 m and the average slope angle ξ corresponds to 0.65°. Its edifice volume was estimated of 97 km^3. An elongate depression can be seen on the eastern flank of the dome, extending approximately 7 km and 50 m depth, the irregular shape explicable in terms of a collapse feature due to subsurface magma migration or as a source vent (Fig. 1c). Clementine UVVIS multispectral mosaic displays oval spread of vent deposits associated with graben. Note the discrete nature of several other foci of LPD's on the dome surface (termed P to U in Fig. 1d).

Spectral data: Clementine UVVIS multispectral data indicate a higher titanium concentration for the dome and associated deposits which show up bluer than the surrounding mare (Fig. 1e). It has a R_{415}/R_{750} ratio of ~0.63 and a 750 nm albedo of 0. 092, while the nearby mare units have lower R_{415}/R_{750} ratios of ~0.60-0.61 and a 750 nm albedo of about 0.11. Moreover, our data indicate that the “relatively” higher TiO_2 and FeO value [4] is associated with the LPD if compared to nearby mare soil not covered by the dark pyroclastic material (Figs. 1f-g). The M^3 spectral data indicate that the absorption band of the dome and the mare surface east of it slightly exceeds 1 µm. The 2 µm absorption is quite flat while the 1 µm absorption is shifted towards higher wavelengths but not broadened as expected for olivine (Fig. 2). Thus the spectra would be attributed to glass or also to a mixture of glass and olivine, as indicated in the Clementine spectral data. No spinel signature was identified.

The spinel deposits, including chromite, present in the *Sinus Aestuum II* region [5-6], are defined by their strong 2 µm absorptions and extremely weak or absent 1 µm absorptions.

Results and discussion: The environs of the dome present a rather complicated picture (Fig. 3), with evidence of extensional forces in the form of faults and graben, compression in the form of wrinkled ridges, pyroclastic volcanic activity in the form of cone (Fig. 1) and finally subsurface magmatic activity as evidenced by collapse features. Using the GDL100 dataset it is possible to determine that this feature is not a section of flat LPD draped mare, but forms a low profile dome like structure elevated above the mare surface to the east and north. A graben that appears to cut the dome is a narrow (approximately 400 m) trough that extends for some 20 km extending from the Caley Formation terrain and across the western part of the dome, interpreted as fracture features that may occur as a result of the flexural uplift [7], likely originated by a magmatic intrusion associated with dikes that ascended to shallow depths below the surface [8]. Even if the bulk of the magma does not reach the surface but remains as an intrusion, it is possible that some connection between volcanic products and the surface may occur through the fractures that form to allow the graben floor to subside. Hence, intrusive and explosive processes, including pyroclastic material, might be involved into the formation of the large dome Sc1 but not necessarily simultaneously (different volcanic phases), and the different volcanic features in the examined lunar region may even have formed completely independent of each other. The fact that the examined dome Sc1 has a very shallow slope and a large diameter is evidence that it has likely originated by a magmatic intrusion. The intrusive activity was followed by a phase of pyroclastic activity, which was possibly related to the vent identified. The laccolith model in [9] yields intrusion depths of 3.4 km and maximum magma pressure in the laccolith of 27 MPa so that the dome SC1 is a typical representative of class In1 as introduced in [9-10].

References: [1] Wilhelms (1968), *USGS I-548*; [2] Weitz et al. (1998) *J. Geophys. Res.* 103 (El0); [3] Scholten et al. (2012) *J. Geophys. Res*. 117 (E00H17); [4] Lucey et al. (2000) *J. Geophys. Res.* 105 (E8), 305; [5] Sunshine et al. (2010) *LPSC XXXXI*, #1508; [6] Sunshine et al. (2014) *LPSC XXXXV*, #2297; [7] Nichols et al. (1974) *Lun. Planet. Sci. V*, 550-552; [8] Wilson and Head (2002) *J. Geophys. Res.* 107 (E8), 5057; [9] Wöhler & Lena (2009) *Icarus* 204, 381-398; [10] Lena et al. (2013) *Lunar Domes: Properties and Fomation Processes*. Springer Praxis Books; [11] Grumpe et al. (2014) *Adv. Space Res.* 53(12) 1735-1767.

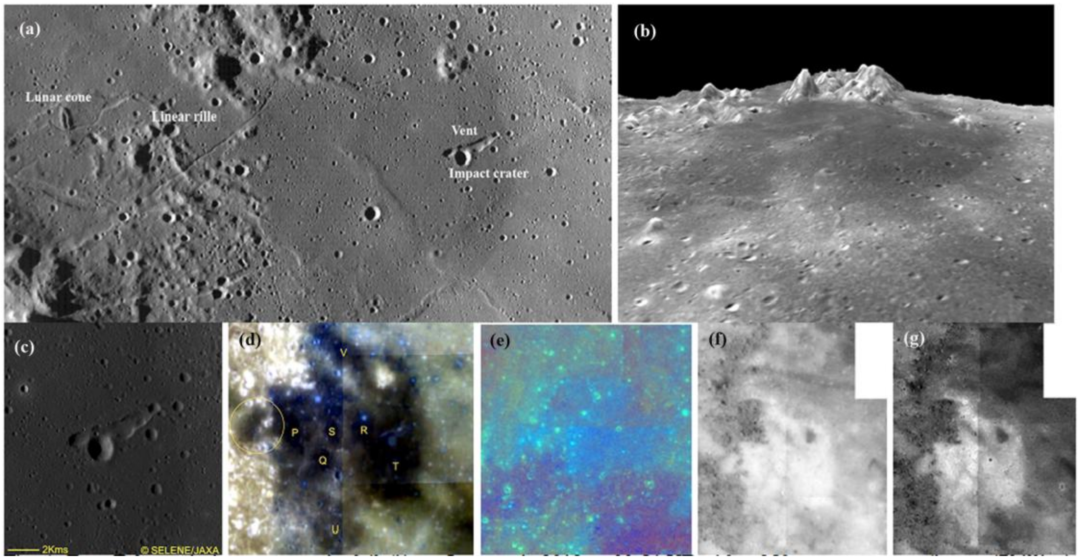

Fig. 1. Top (a) WAC 11752848ME including the examined features; (b) WAC draped on top of the global LROCWAC-derived elevation model (GLD100). The elevation of the dome corresponds to 200 m; Bottom (c) vent as imaged by Selene; (d) Clementine UVVIS multispectral mosaic of the dome termed Sc1 showing oval spread of vent deposits associated with graben (circled). Note the discrete nature of several other foci of DMD's on the dome surface (P to U); (e) Clementine color image (R_{750}/R_{415} red channel, R_{750}/R_{950} green channel and R_{415}/R_{750} blue channel); (f) FeO map as described in [4], range 10 wt% to 20 wt%; (g) TiO_2 map as described in [4], range 1 wt% to 10 wt%. Note that the derived amounts of Ti and Fe might not be appropriate for some deposits due to the possible presence of high amounts of glasses and other unknown factors.

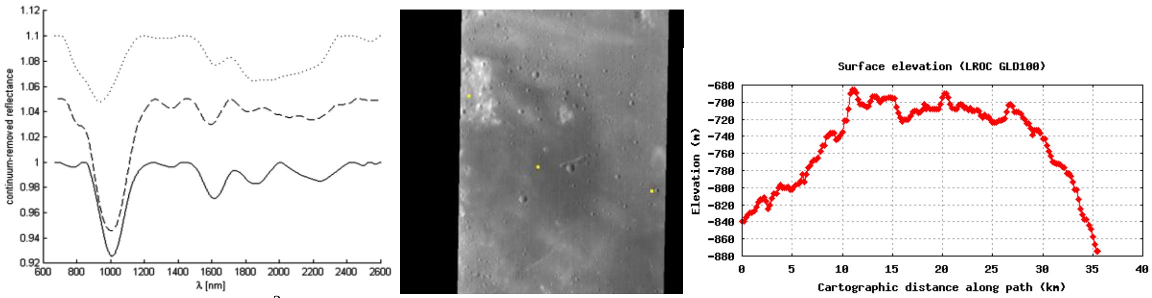

Fig. 2. (Left) solid curve M^3spectrum of the dome as described in [11], dashed curve mare surface east of the dome and dotted curve highland surface northwest of the dome; (middle) dots indicate the locations of the three examined spectra M^3 image M3G20090206T010833_V03; (right) Cross-sectional profile in N-S direction of Sc1 dome based on GLD100 dataset.

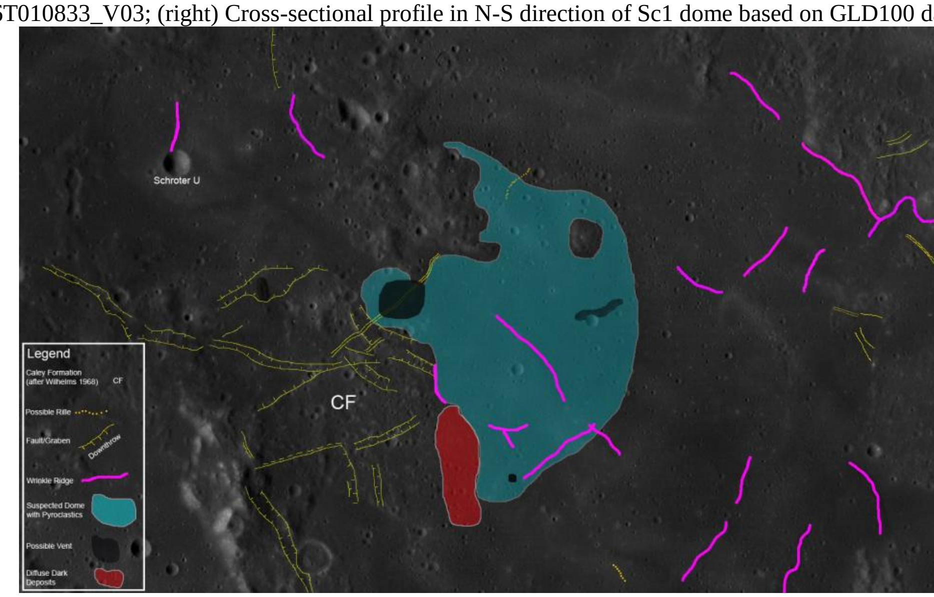

Fig. 3. Geological sketch map based on LROC WAC imagery of the area.