ASTEROIDS PHOTOMETRY SIMULATED IN THE LABORATORY: PHASE FUNCTIONS OF SOME METEORITES USED AS IRREGULAR ASTEROID MODELS.

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Laboratory simulations have been used to study the behaviour of the photometric lightcurves of the asteroids by various authors (Dunlap,1971;Barucci et al.,1982; Barucci & Fulchignoni,1982,1983). In these papers some characteristics of the photometric lightcurves have been discussed using the data obtained with models with a chemical composition far from the actual chemistry of the asteroids. Veverka (1971) discuss the physical meaning of phase coefficient analyzing both experimental and theoretical results.

In this work the authors use as irregular asteroid-models few meteorites selected from the specimens of the Vatican collection (King & Salvatori, 1984), in order to study the phase function of some natural object with a chemistry which seems close enough to the asteroid composition, on the basis of IR spectral data.

Measurements have been carried out in laboratory by means of an experimental apparatus called SAM (the acronym stands for System for Asteroid Models) described by Barucci et al. (1982), in order to obtain the phase function of different meteorite samples.

The choice of these samples has been determined on the basis of their analogy to the asteroids (Gaffey & McCord,1979) as for the taxonomic classification Zellner (1979).The measurements have been achieved on six specimens:

1- a. VacaMuerta, mesosiderite. Individual rock (w. 145g, maximum dimension 5.9 cm) covered by an oxidized coating;
   b. VacaMuerta, mesosiderite. Slab (w. 25 g, m.d. 4.6 cm) with one polished surface.

2- Crab Orchard, mesosiderite. Individual rock (w.250g, m.d.6.3 cm) with one surface sawn and polished and the others covered with oxidized coating.

3- Finmarken, pallasite. Slab (w. 323 g, m.d. 11.5 cm).

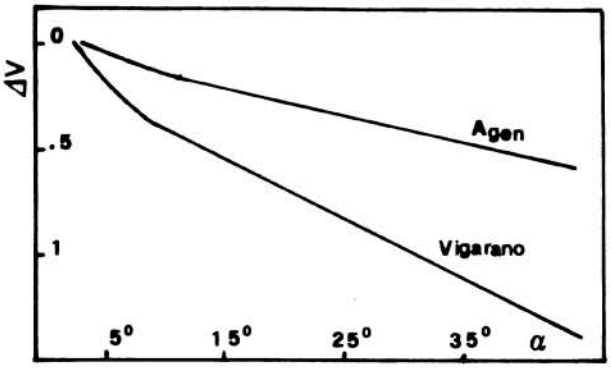
4- Canon Diablo, iron. Individual rock (w. 924 g, m.d. 11.3 cm) with altered surface.

5- Vigarano,carbonaceous chondrite C3 type.Slab (w. 86g. m.d. 6.6 cm).

6- Agen, veined intermediate olivine-bronzite chondrite (H5), (w. 685 g, m.d. 12 cm). Fragment 50 % fusion crusted.

The albedo of each specimen have been measured using a MgO tar

get as standard. Albedo values of the examined specimen range between 0.06 and 0.29. Photometric measurements have been performed for each specimen by means of SAM, with phase angle varying between 2° and 45°. Each specimen has been placed in such a way as to get measurements for all sides, in order to determine photometric variations for each area and surface characteristics. Eighteen phase curves have been obtained. The phase coefficient β and the multiscattering coefficient Q have been calculated on these curves and these have been then compared to the values of the corresponding asteroid types. The phase coefficent has been calculated using the least square method on the measurements obtained for phase angles larger than 10° to neglect the opposition effect. The multiscattering coefficient has been calculated using the relationship given by Bowell & Lumme (1979,1981).The trend of the phase curves is analogous to the asteroid's one. The meteorites with polished surface have a different behaviour which is dominated by backscattering: the corresponding $\beta \sim 0$. The mesosiderite curves are similar to the pallasite ones. These meteorites are representative of the S type asteroids, their Q values range between 0.29 and 0.39, but the weathering has probably changed the surface physical properties. In figure 1 the phase functions for Vigarano and Agen meteorites are reported.



The phase functons of the Vigarano and Agen meteorites, show a different shape which is due to the different texture and composition of their rough surfaces. The values of the g parameters of the Henyey & Greenstein (1941) phase function are in the range 0.60-0.65 and 0.45-0.50 respectively: this indicates that the individual paricles are partially backscattering. The values of the multiple scattering factor Q are 0.17 and 0.48 respectively. Both meteorites have been selected as representative of the composition of the S type asteroids on the basis of the IR compared spectrometry. The photometric classification of Vigarano coincides with the spectral one, while the Agen appurtenance to class E, as deduced photometrically, is in contrast with the IR data. The different results obtained with the photometry indicate that the regolith layer on the asteroid surfaces is responsible of their scattering properties.

References: Barucci et al.,1982,The Moon & the Planets,27,387;Barucci & Fulchignoni,1982,Hvar Obs.Bull.6,157;Barucci & Fulchignoni,1983, Asteroids,Comets,Meteors (Lagerkvist & Rickman Eds.),101;Bowell & Lumme,1979,Asteroids (Gehrels Ed),132;Dunlap,1971,NASA SP 267,147; Gaffey &McCord,1979,Asteroids (Gehrels Ed.),688;Henyey &Greenstain, 1941)Astroph.J.,93,70;Lumme & Bowell,1981,Astron.J.86,1694;Veverka, (1971) NASA SP 267,79;Zellner,1979,Asteroids (Gehrels Ed.),783.