so the gating sequence could be related to the centre of the Sun by reference to data from the optical sensor behind the X-ray collimator. Data from the two modes of acquisition are complementary. The direct telemetry of stretched pulses provides better angular resolution but has a large and poorly defined dead time (which differs for the two energy channels) while the gated scalers have negligible dead time but poorer angular resolution.

The Hα picture shown in Fig. 1 was taken at the time the rocket was launched. Both McMath plages 9735, on the north-east limb, and 9726, in the north near co-ordinate zero, showed localized Hα brightening of subflare intensity shortly before and during the rocket flight.

The median of the large peak in the distribution of Fig. 1 occurs at -13.7 ± 0.7 arc min and the distribution is consistent with that from a point source to within the angular resolution of the collimator. In this coordinate system plage 9735 is located at -14 arc min. Because no other region active in Hα is apparent within 6 arc min of this coordinate one may assign the bulk of solar X-ray emission observed during this flight to plage 9735. There is some evidence for another peak in the response of at least the low energy channel near a coordinate of 2 arc min. It seems probable that this emission is from plage 9726 because examination of flare patrol films from Lockheed Solar Observatory revealed a small Hα brightening accompanied by a tiny dark surge from this region with maximum at about 2316 UT. This event was also reported by the Manila Observatory in *Solar–Geophysical Data*. The locations of both X-ray emitting regions are consistent with low energy data from the American Science and Engineering X-ray telescope on OSO-4 (A. S. Krieger, private communication).

From data acquired by the gated scalers and those of Fig. 1 we have determined that at least 92 per cent of the total solar X-ray emission above 3 keV came from plage 9735 during the time of the flight. The ratio of counts collected in the two X-ray energy channels of this instrument is consistent with that to be expected from a thermal bremsstrahlung spectrum with a colour temperature of approximately 10^7 K. This agrees with measurements from other detector systems with better spectral resolution on board the rocket. These data revealed a strong time dependence of the solar X-ray flux during our flight and will be discussed in a future publication.

We thank R. Caravalho, A. J. Meyerott, W. G. Soltwedel and the Sounding Rocket Branch of NASA Goddard Space Flight Center for help. This research was supported by NASA and by the Lockheed Independent Research Programme.

R. C. Catura
L. W. Acton
P. C. Fisher

Lockheed Palo Alto Research Laboratory,
Palo Alto, California.

Received May 1, 1970.

[1] Underwood, J. H., and Muney, W. S., *Solar Phys.*, 1, 129 (1967).
[2] Pounds, K. A., and Russell, P. C., *Space Res.*, 6, 38 (1966).

Mare Orientale Gravity Anomaly

Sjogren has reported that there is an annular negative gravity anomaly surrounding a small positive anomaly over the central basin of Mare Orientale (paper given at the NATO Advanced Study Institute on the Moon and Planets, Newcastle, April 1970). I should like to point out that outside this negative ring, there is a positive ring and perhaps further alternating rings. This outer positive ring contains as much apparent surface mass as the inner negative ring. The integrated mass anomaly associated with the Orientale region is very nearly equal to the central positive anomaly.

Fig. 1 shows the mass points near Mare Orientale for the surface distribution used by Sjogren (unpublished work of Wong *et al.*). The approximate boundaries of the ring anomalies are shown. The sum of the points in the central peak is $4.74 \times 10^{-6} M_m$, where M_m is the mass of the Moon. The masses in the negative and positive half rings east of the north–south line through the topographic centre of Mare Orientale are $-11.42 \times 10^{-6}\ M_m$ and $+11.58 \times 10^{-6}\ M_m$. In order to have approximately concentric rings, four negative points are included in the positive ring. The crucial point, however, is that the total surface mass in the positive and negative region outside the central peak and inside the outer boundary is only $+0.04 \times 10^{-6}\ M_m$. Including the points west of the bisectrix does not change this result very much. These points, however, particularly the $+1.59$ point in the extreme south-west, are quite unreliable because of the end effect (refs. 1 and 2 and unpublished work of myself and others) of the least squares fit to the south-east/north-west arcs of the satellite data.

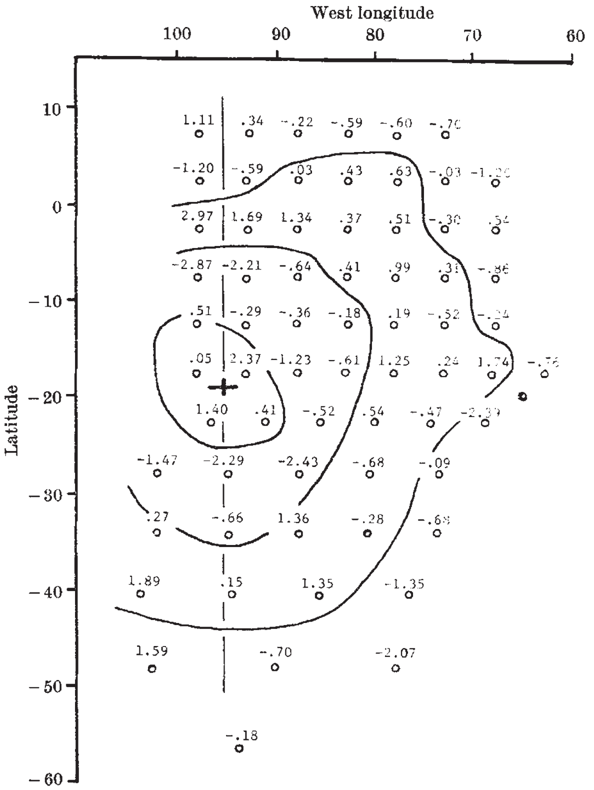

Fig. 1. The dynamically determined surface mass points in the Mare Orientale region. The units are 10^{-6} lunar masses. The cross marks the topographic centre of Mare Orientale.

I have not yet decided whether the ring anomalies are a physical reality or a result of the technique used to compute the mass points. The rough coincidence between the inner and outer boundaries of the negative anomaly and the inner and outermost topographic rings around Mare Orientale may support a physical origin. In a paper submitted for publication elsewhere, I argue that the central anomaly is consistent with the amount of mare material exposed on the floor of Orientale's central basin. The negative ring anomaly may be due to the topography of the Orientale region, while the positive anomaly might be associated with a rather asymmetrical ejecta blanket lying outside the largest topographic ring.

This research was supported by the US National Aeronautics and Space Administration.

John R. Booker

Geophysics Department, Stanford University,
Stanford, California 94305.

Received May 14, 1970.

[1] Kaula, W. M., *Science*, 166, 1581 (1969).
[2] Muller, P. M., and Sjogren, W. L., *Science*, 161, 680 (1968).