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## GRAVITATIONAL CONSTRAINTS ON THE INTERNAL STRUCTURE OF THE GALILEAN SATELLITES

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Before the arrival of the Galileo spacecraft in the jovian system, there was little information on the interior structure of Jupiter's four Galilean satellites. Mean densities, determined by the Pioneer and Voyager spacecraft, suggest that the two inner satellites, Io and Europa, are mostly rock, while the two outer satellites, Ganymede and Callisto, consist of rock and ice. By means of radio Doppler data, we report measurements of the satellites' spherical harmonics,  $J_2$  and  $C_{22}$ , for their respective gravitational fields. These data show clearly that Io has a large metallic core, that Ganymede has differentiated into a core and mantle, and that Callisto is homogeneous. Results for Europa are not yet available, but they will be reported at the meeting. Combined with the Galileo discovery of a substantial magnetic field for Ganymede, our results suggest that both Io and Ganymede have metallic cores containing iron and probably an iron sulfide alloy. We find that Ganymede and Io could be essentially identical, except that Ganymede, unlike Io, has an outer layer of ice approximately 800 km thick. On the other hand, it seems that Callisto, most likely because of its more remote orbital location from Jupiter, is a pristine solar system body that has not experienced the heating phases evident for Io and Ganymede.

### Submittal Information

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3. G. Neukum and T. V. Johnson
4. none
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