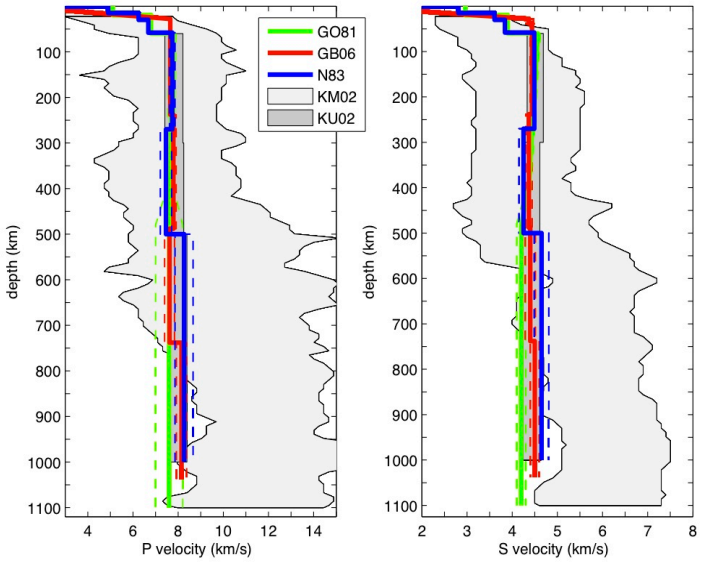
Deep Interior of the Moon

Philippe Lognonné
Email : lognonne@ipgp.fr
Equipe Géophysique Spatiale et Planétaire
Institut de Physique du Globe de Paris-Université Paris Diderot
4 Avenue de Neptune
94100 Saint Maur des Fossés

The Moon is the only other terrestrial body than Earth in the solar system for which seismologically constrained models of the Deep interior are available. These models were mainly obtained from inversions of the geophysical data provided by seismometers and Lunar Laser Reflectors deployed by the Apollo mission plus, for LLR, by two soviet Lunahkods. They constrains the seismic velocities and attenuation up to depth of about 1000km, about 2/3 of the Lunar interior, as well as the mean density, inertia factor and Love numbers. Additional magnetometer orbital data have allowed a magnetic sounding and provide therefore constrains on the electric conductivity

In the existing models, no consensus on the crustal thickness, on the possible mantle discontinuities and on the core size are however reached: estimations of the crust near the Apollo landing sites range from 30km to 60 km, the core size depends strongly on its unknown density and might range from 250 to 450 km and depths of 500km, where a possible discontinuity related to the base of a primitive magma ocean was proposed appear to be weakly covered by the collected seismic rays.

As these uncertainties impact directly on the depth of the primordial magma ocean, care must be taken in using these models for geochemical interpretations. Reasonable constrains on the thermal state and mineralogy of the lunar upper mantle can however be proposed, as well as on the temperature at the depth of the Deep Moon Quakes.



Range of published models for the seismic models of the Deep Lunar Interior, including their errors.

Improvements of our understanding of the Moon Deep interior are therefore requested and we present both short term perspectives, based on the reprocessing of the Apollo data or even geophysical re-discovery of lunar landed instruments (e.g. Apollo 17 gravimeter or Lunakhod-1 LLR), and long term perspectives associated to future missions, such as the JAXA SELENE2 or US Moon landers missions.