Instrumentation for Nuclear Planetology: Present and Future

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The method of remote neutron and gamma spectrometry of bodies in the solar system (the Moon, Mars, and Mercury) has been used for several decades to estimate the nuclear composition of these objects and the hydrogen abundance in their subsurface layers. It is known that many solid planets of Solar system with thin atmospheres, its moons, small bodies and even comets due to bombardment by heavy nucleus of Galactic Cosmic Rays (GRS) produce neutron albedo and characteristic gamma lines. Detection of escaping gammas and neutrons (remote sensing from an orbit or in situ) bringing an information about elemental composition of the subsurface and hydrogen-containing elements (as deep as tens of centimeters). Currently we can classify all nuclear planetology instruments by the field of view (uncollimated and collimated) and by type of soil irradiation (passive – using GRS, and active – using pulsing neutron generator onboard), each of those methods has pros and cons and all of them will be presented. Also, future nuclear planetology instruments and method in design will be presented.