Thermal conductivity determination of cometary and asteroid material analogues

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Measurements of physical properties of surface and subsurface layers of planetary bodies often provide important information about the structure of the medium and processes that occur there. Thermal properties of cometary nuclues subsurface material are crucial in determining the heat and gas transport. Similarly, asteroid's regolith is a buffering zone in heat transfer from(to) surface to(from) interior of a body. There are space experiments planned to perform temperature and thermal conductivity measurements on a comet (ROSETTA) and one can easily foresee such measurements carried out by future robotic missions on Mars, planetary satellites and asteroids. In the paper we present the results of measurements carried out with a new type of thermal sensors. The elementary cylindrical sensor is made of platinum wire (resistance thermometer) and isotan wire (heating element) that can operate independently. By choosing these materials the problems of temperature measurement calibration and constant heating power are resolved. We confront the results of measurements made for a number of sensors combined into a long cylinder in delrin, basalt, ice-dust mixture (comet analogue) and regolith-like material with models and show that agreement is very good. Therefore, we can recommend both the sensors and the method of data interpretation for the thermal conductivity determination as very useful tools in future space missions and in laboratory experiments on cometary and asteroid material analogues.