Planetary Science with Small Satellites: Opportunities and Challenges

Small satellites aren't anything particularly new. Earth orbiting small satellites go back 30 years or more. What is new is the proliferation and access to small satellite technologies and flight opportunities. This has been in large part due to the advent of the "cubesat" model, initially a means to develop student's engineering skills, but has since evolved into an industry and accepted method within government space agencies. Until very recently these smallsats were limited to Earth orbiting missions, but with the successful flight of the MarCO spacecraft and the upcoming launch of EM-1 cubesats, the Moon, Mars and beyond are now within reach. While all this is good news, we still have a ways to go before smallsats become true planetary science tools. One could argue that Deep Space 2 was the first planetary smallsat, launched in 1999 and having a mass of 2.3 kg (each probe) it hoped to demonstrate that "real" science could be done with a small (and less expensive) package. The DS2 failure shelved the idea of smallsats (even chilling some to "Class D" planetary missions in general) for nearly two decades. NASA has slowly come back around to smallsats for planetary missions, going so far as to support a range of mission studies (the Planetary Science Deep Space SmallSat Studies, or PSDS3, Program) and the creation of a new Program (SIMPLEx) to developed such missions for opportunistic flights. The MarCO success was hugely important in maintaining (and building) this forward momentum. However, we still have yet to demonstrate "real" science from a planetary smallsat and there are some fundamental disconnects between expectation and reality. This talk will discuss some of the opportunities and challenges that reside with planetary smallsats, focusing on two examples: LunaH-Map (the first SIMPLEx cubesat) and Aeolus (a Mars PSDS3 smallsat concept).