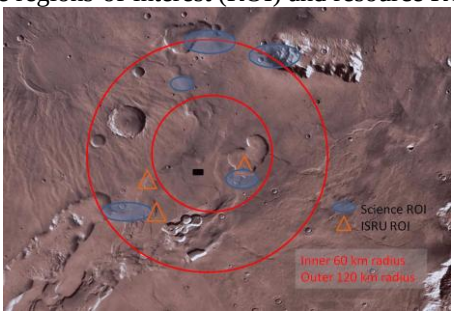
THE JOUNEY TO MARS WITH ISRU PATHWAY. J. C. Hamilton[1,2], R.F.V. Romo[2], R.M. Kelso[2], and C. Andersen[2],, [1]Dept. of Physics & Astronomy, University of Hawaii-Hilo (200 W. Kawili St. Hilo, HI 96720); jch@hawaii.edu, [2]Pacific Internation Space Center for Exploration Systems [PISCES] (99 Aupuni St, Hilo, Hawaii 96720). rfvromo@gmail.com, rkelso54@gmail.com, canderse@hawaii.edu

Introduction: NASA's new Journey to Mars program has reinvigorated their prior Evolvable Mars Campaign with more focus and clarity and a renewed emphasis on ISRU, perhaps as a critical path. I will survey relevant past ISRU efforts as they relate to the current exploration paradigm outlined by NASA recently .

BASALT: This Mars analog grant under the Planetary Science and Technology Through Analog Research (PSTAR) is de-acronymed as Biologic Analog Science Associated with Lava Terrains (BASALT) [1]. Lead by NASA Ames, utilizes two lava flows as Mars analogs for different epochs in Mars history. The first analog are flows at the Hawaii Volcanos National Park on the island of Hawaii as analogs for early (wet) Mars, when lava interacted with water and formed distict mineral signatures. The second analog are flows at the Craters of the Moon in Idaho representative of an older, drier Mars. This project will create and test the future surface protocols for astronauts to collect simulanteous geologic and biologic samples, as well as traverse planning and execution.

Manned Mars Landing/Exploration Zone: Complementary to the BASALT project is the and philosophy revealed at First Landing Site/Exploration Zone Workshop for Human Missions to the Surface of Mars last October. Revealing the new paradigm of an Exploration Zone area with multiple crew landings and infrastructure build-up, this places ISRU firmly in the drivers seat for civil engineering of habitats and support structures. I will use as an archtype the sites proposed by our team to illustrate the selection rubric with science regions-of-interest (ROI) and resource ROIs.



Phobos & Deimos. Renewed interest in utilizing the small moons of Mars as ready-made orbital assets for the main Mars mission, with sorties to the surface. This is evidenced by the SSERVI virtual course last year, and the orbital paramenters imposed on the proposed site candidate sites.

PISCES ISRU field tests. I will illustrate some of the required surface technologies for Mars exploration using examples from the three NASA/CSA in-stiu resource utilization field tests in 2008, 2010 and 2012. The successful demonstration of these systems will point the way toward development of flight units (along with durability testing for human rated systems). The high-fidelity geochemical match evidenced by ChemMin on Curiosity shows the value of long-term field testing in Hawaii.

Challenges for the future. For science one considers sampling and collection, for mining one must prospect. These activities are not synonomous, especially in regards to remote sensing and orbial imaging. Prospecting

References:

[1] Darlene S.S. Lim (PI) et. al. Biologic Analog Science Associated with Lava Terrains. (NASA NNH14ZDA001NPSTAR) *http://spacescience.arc.nasa.gov/basalt/. (2015)*

[2] J.C. Hamilton, S. Lundblad, D.L. Clark, N.G. Purves, C.T. Milovsoroff, N. Thomas. Ausonia Cavus And Kasei Valles: Complementary Exploration Zone Sites For Biology, Geology And ISRU**.** First Landing Site/Exploration Zone Workshop for Human Missions to the Surface of Mars [Paper #1045] *http://www.hou.usra.edu/meetings/explorationzone2015/*

[3] J.C. Hamilton, Analog Field Testing Opportunities in Hawaii: a Review of the 2012 Summer Test and Future Prospects. PTMSS 2013 SRR 14.