

EuroMoonMars Instruments, Research, Field Campaigns, and activities 2017-2019

B. Foing & EuroMoonMars 2018-2019 team*

ESA ESTEC, ILEWG International Lunar Exploration Working Group, EuroMoonMars Team, Vrije Universiteit Amsterdam

Introductions:

ILEWG has developed, since 2008, "EuroMoonMars", an evolving pilot research programme with a series of instruments, investigations, facilities that are relevant to MoonMars science, astrobiology, technology, habitability, utilisation as well as inspiration, education for young professionals and public. We have organised field campaigns (EuroMoonMars) in specific locations of technical, scientific and exploration interest.

Instrument demo campaigns:

Field tests have been conducted in ESTEC, EAC, at Utah MDRS station, Eifel, Rio Tinto, Iceland, La Reunion, Hawaii, and LunAres base at Pila Poland in summer 2017. These were organised by ILEWG in partnership with ESTEC, VU Amsterdam, NASA Ames, GWU in Utah MDRS (EuroGeoMars 2009, and then yearly for EuroMoonMars 2010-2013).

Other EuroMoonMars analogue field campaigns using selected instruments from ExoGeoLab suite were conducted in other MoonMars extreme analogues such as Eifel volcano, Rio Tinto, Iceland, La Reunion, Hawaii. The ExoGeoLab research incubator project, has started in the frame of a collaboration between ILEWG [3] (International Lunar Exploration working Group <http://sci.esa.int/ilewg>), ESTEC and partners, supported by a design and control desk in the European Space Incubator (ESI), as well as infrastructure. We brought the ExoGeoLab lander and suite of instruments for a test campaign at Eifel volcano park in Germany in 2009 (EuroMoonMars 2009), and more recently in 2015 & 2016.

We tested various phases of a robotic lander mission (rover deployment, lander inspection, instruments remote operations, lander + 2 rovers cooperative operations, sample collection and

analysis) as well as possible operations during Extravehicular activity astronaut simulations.

We have been starting with a Robotic Test Bench (ExoGeoLab) and a Mobile Laboratory Habitat (ExoHab) at ESTEC. An autonomous Laboratory (ExoLab) has been added later for astrobiology, sample analysis and life sciences. In Summer 2017, the ILEWG ExoGeoLab lander was brought to be part of a series of MoonMars simulation campaigns in LunAres base just completed in Pila airport, Poland.

Within EuroMoonMars 2018-19 we supported field campaigns at HiSeas in Hawaii, Eifel, IgLuna and Iceland. We are also supporting the definition of a science and astrobiology lab for MoonMars base simulation facilities (ExoHab-Luna, EAC-Luna, LunAres Poland, Moon and Mars Base Analog MAMBA in ZARM, IGLUNA Ice Habitat in Switzerland, HiSea-MoonMbase Hawaii, Iceland lavatube ice base)

Acknowledgements “*We thank the participants and collaborators for the ILEWG EuroMoonMars 2009- 2019 campaigns at ESTEC, Utah MDRS, HiSeas Hawaii, Eifel Volcano & at LunAres base, Poland. We acknowledge the contributors from EarthMoonMars Village Teams:

EuroMoonMars/Igluna VU Amsterdam 2018-2019 team: B.De Winter⁴, M.Heemskerck⁴, M.Daeter⁴, D.Beentjes⁴, M.Berg⁴, R.Bas Korthouwer⁴, G.Vaessen⁴, S.Van Bloois⁴, I.Brouwers⁴, A.Kruijver⁴, B.Albers⁴, , K. Molag, T. Clement, A. Weert

ILEWG EuroMoonMars /IgLuna 2018-2019 team: T. Benavides, M.Grosjean, A.Sitnikova, J.Preusterink, M.C.Gellings, A.Tomic. G vd Sanden, D. Moritz, M. Löffler, J. Flache, L. Dimova, A. Wanske, T. Alvarez, I. Schlacht, E.P. Montgomery, A. Tomic, A. Zaklynsky, A. Izotova, J. Lundy,

ILEWG EuroMoonMars 2018: E. Clavé, L. Dubois, Y. Akisheva,

EarthMoonMars 2019 ILEWG/Hiseas/MDRS: H. Rogers, M. Musilova, C. Felix, Y. Gonzalez, B. Pothier, N. Sirikan, V. Triviño, M. Grulich,

MoonVillage 2017-2019 team: A. Kolodziejczyk, C. Heinicke, A. Lillo, I. Schlacht, A. Kapoglou, M. Harasymczuk, N. Verschoor, S. Lizy-Destrez, S. Hettrich, H. Gassabian, J. Cami, V. Foing, J.L. Moro, I. Sisaid, E. Garcia Bourne, P-A. Joumel, L. Ferreira, TaiSik Lee, J. Silk, A. Decadi, A. Wendler, M. Wilde, T. Pacher, M-P. Boucher, J. Ivey, V. Beldavs, H. Rogers, J. Crisafulli, G. Reibaldi, C. Welch, O. Ben-Horin,

References

[1] Foing, B.H. et al. (2009) LPI, 40, 2567; [2] Mahapatra P et al (2010) LPI, 41, 1374; 89 [3] Groemer G et al (2010) LPI, 41 [4] Foing B. H. et al. (2011) Special Issue 10 (3), IJA. [5] Ehrenfreund et al. (2011) (IJA 2011, 10 (3), 239 [6] Stoker C. et al (2011) IJA 2011, 10 (3), 269 [7] Kotler et al. (2011). IJA 2011, 10 (3), 221; [8] Groemer G. et al. (2010) LPSC 41, Abstract 1680 [9] Foing B. H. et al. (2014) LPSC 45, Abstract 2675 [10] Foing B. H. et al. (2016) LPSC 47, Abstract 2719 [11] Batenburg P. et al. (2016) LPSC 47, Abstract 2798 [12] Offringa M. S. et al (2016) LPSC 47, 2522 [13] Kamps O. M. et al (2016) LPSC 47, Abstract 2508