

Citation Speech for Mattia de' Michieli Vitturi by Augusto Neri, Amanda Clarke, and Barry Voight; read by Augusto Neri.

Good evening ladies and gentlemen. For a mentor there can be no higher honour than to introduce a young colleague for such a significant award. I wish to warmly thank Barry Voight and Amanda Clarke for giving me today such a unique pleasure and honour. And today our pleasure is double. We proudly introduce Mattia de' Michieli Vitturi for the Wager Medal.

His brilliant work, energized by remarkable abilities in mathematics and a deep understanding of physics, is fundamentally important and is having significant impacts on volcanology.

The key skills that Mattia possesses are his creativity in using math and numerical schemes to seemingly effortlessly solve a wide-range of physical problems in volcanology that would otherwise not be easily addressed. We don't really see any limit to his ability to attack new problems in complex volcanic and natural systems. He is constantly pushing his own boundaries in terms of mathematical approaches, in order to understand volcanoes, hydrothermal systems, and other complex fluid systems. He has emerged as an international leader in developing original state-of-the-art multiphase flow codes to simulate explosive volcanic eruptions, involving some of the most difficult problems in geophysical fluid dynamics.

We offer a few examples in order to highlight Mattia's strengths as a researcher in this field.

Mattia developed original and innovative magma-flow models for two-phase flows in conduits of variable shape in order to quantify relationships between conduit geometry, magma ascent dynamics and the development of conduit lava plugs due to permeable gas loss. This approach was extended to show how sudden changes in chamber conditions affect eruption rate, and how a conduit plug controls eruption cyclicity. These codes were able to simultaneously deal with multiple flow regimes and realistic magma properties as was not possible before.

He was the main developer of a new immersed-boundary technique

suiting to compressible multiphase flows that enable description of interface conditions between the flow and irregular 2D and 3D topography. This was a key to reducing error in multiphase multiparticle flow codes associated with descriptions of topography, which are now able to simulate complicated eruption dynamics in fully 3D conditions. He also developed Lagrangian codes to predict dispersal of ballistics in Vulcanian-style eruptions, including the effects of the multiphase eruption column flow on ballistic trajectories. This had never before been attempted and his work represents the state-of-the-art on this complex process.

And yet another new project involves development of numerical integral models to study explosive volcanic eruptions on Earth and other planetary bodies. He coupled magma chamber dynamics with conduit ascent and explosive plume generation. This coupled approach required dealing with multiple flow regimes, entrainment, and buoyancy, critical for understanding the complex combined effects of reduced gravity and alternative atmospheric conditions on other planetary bodies. Mattia's new approach represents real progress and helps to improve understanding of Mars explosive volcanism and to better interpret new NASA datasets.

Mattia also contributed to the assessment of volcanic hazards during crises. His new lava flow code has been adopted by the Icelandic Meteorological Office for the Bardarbunga eruption. He also has developed new plume and ash dispersal models to quantify uncertainty in multiphase flow modeling, toward appreciation of risk implications.

In sum, Mattia is a brilliant young scientist, one of a very small group of global leaders in the field of mathematical modeling applied to volcanology, and one with a remarkably broad spectrum of contributions.

He is a fine man and superb colleague, and his remarkable and original research contributions to volcanology and volcanic risk mitigation make him a most worthy recipient of the 2015 Wager Medal.

Congratulations Mattia!

Augusto Neri, Amanda B Clarke and Barry Voight