CV

MASSIMO VELLANTE

updated at July 2021

Born in Sulmona (Italy) on 28 August 1956.

1981: Graduated in Physics at L'Aquila University discussing a thesis in Space Physics ("Analysis on magnetohydrodynamic fluctuations between 0.3 and 1 AU").

1983-2006: Researcher at the Physics Department of L'Aquila University.

December 1983-November 1984: CNR fellowship at Center for Space Research, Massachusetts Institute of Technology.

2006-present: associate Professor at L'Aquila University.

Research activity

Since 1983 he partecipates to the research activities of the group of Geomagnetism and Space Physics at L'Aquila University. At the beginning, he works on the identification of magnetohydrodynamic fluctuations in the solar wind using data from Helios and Voyager spacecraft. Then, he works on the analysis and interpretation of the ULF geomagnetic pulsations which are recorded at the Geomagnetic Observatory of L'Aquila. In particular he conducts several studies concerning ULF wave propagation in the magnetosphere, solar wind dependence of ULF wave activity, geomagnetic Field Line Resonances (FLR) and their use for remote sensing the magnetospheric plasma mass density. He has also investigated problems related to the magnetic sounding of the earth's crust making theoretical and methodological developments of the two-level magnetovariational technique. Presently he is the responsible of the ground-based magnetometer network SEGMA (South Europe GeoMagnetic Array) and co-PI of the european magnetometer network EMMA for monitoring dynamical phenomena in the earth's magnetosphere and in particular for remote sensing the plasmasphere using the FLR technique.

Results of particular scientific relevance

Analysis of magnetohydrodynamic fluctuations in the solar wind at large heliocentric distances using data from Voyager 1 and Voyager 2 spacecraft. This study, initiated during a fellowship spent at the *Center for Space Research of the Massachusetts Institute of Technology*, has evidenced for the first time that the dominant characteristic of the solar wind microscale at distances larger than 3 AU is represented by structures characterized by a balance between magnetic and thermal pressure. This work (*Vellante and Lazarus, J. Geophys. Res., 1987*) has received numerous citations and has stimulated new theoretical deepenings from other researchers.

First identification in the scientific literature of a solar cycle variation of the geomagnetic field line resonance frequency and its interpretation in terms of a correspondent variation of the plasma mass density along the field lines (*Vellante et al., Geophys. Res. Lett., 1996*).

Original verification, using simultaneous measurements on ground and in space (CHAMP satellite), of the geomagnetic field line resonance model, as well as of the effects produced by the ionosphere in the transmission of magnetospheric ULF waves to the ground (*Vellante et al., J. Geophys. Res., 2004*). This work has also evidenced for the first time in the satellite measurements a Doppler effect due to the rapid movement of the satellite through the resonance region.

Responsibility in research projects

1995/98: "Ground-Based monitoring of the plasma environment and sounding of the Earth's crust by ULF waves" (University of L'Aquila, GeoForschungsZentrum Potsdam, IPE Moscow). Supported by the International Association for the Promotion of Cooperation with Scientists from the Independent States of the Former Soviet Union (INTAS). Principal investigator.

1998/99: "Space Weather program" (University of L'Aquila, University of Roma Tor Vergata, University of Calabria, University of Florence, IFSI). Supported by Consiglio Nazionale delle Ricerche (CNR). Principal investigator.

1998/00: "Space Weather Monitoring by Ground-Based Measurements of ULF Waves in a Meridional Array" (University of L'Aquila, Geodetic and Geophysical Research Institute of Hungarian Academy of Sciences). Supported by the Italian Minister of Foreign Affairs. Principal investigator.

2001/03: "Multi-point Measurements of Geomagnetic Pulsations at Mid-latitudes: Interplanetary, Magnetospheric, and Ionospheric Effects " (University of L'Aquila, Geophysical Institute of the Bulgarian Academy of Sciences). Supported by CNR. Italian Partner Coordinator.

2004/06: "Geomagnetic phenomena in the polar caps as observed in Antarctica and arctic" (University of L'Aquila, British Antarctic Survey, Danish Meteorological Institute, IPE Russia, IZMIRAN Russia, ISTP Russia, IKFIA Russia). Supported by INTAS. Leader of the italian team.

2004/06: "Study of electromagnetic waves coming from the Earth's surface" (University of L'Aquila, Space Research Institute of Graz, Geophysical Institute of Sofia). Approved by a selection committee of CNES (Orleans, France). Leader of the italian team.

2007/09: "Analysis of electromagnetic observation from SEGMA related to global monitoring for environment and security" (University of L'Aquila, Geophysical Institute of the Bulgarian Academy of Sciences). Supported by CNR. Italian Partner Coordinator.

2011/14: Responsible of the Work Package "Retrieval of equatorial plasma mass densities by magnetometer arrays and cross-calibration" of the FP7-SPACE-2010-1 project "A new, ground based data-assimilative modeling of the Earth's plasmasphere - a critical contribution to Radiation Belt modeling for Space Weather purposes" supported by the European Community.

2017/2018: Member of an international team of 12 researchers working on the project "Investigating the Magnetosphere through Magnetoseismology" (leader: Peter Chi, University of California-UCLA), selected by the International Space Science Institute of Bern (ISSI).

2019/22: "Circumterrestrial Environment: Impact of Sun-Earth Interaction". Supported by MIUR (PRIN-2017). Responsible of the research unit of L'Aquila University.

Presently he is the scientific coordinator of a collaboration with the Space Research Institute of Graz (Austria) for the management of the ground-based magnetometer network SEGMA (South Europe GeoMagnetic Array) and and co-PI of the european magnetometer network EMMA.

Besides these projects he collaborated to several other scientific projects supported by MIUR, CNR, ASI and ENEA.

Member of the scientific committee of the symposium "ULF and VLF waves in the magnetosphere" of the "First S-RAMP Conference" (Sapporo, Japan, October 2000).

Co-director of the course "*Turbulence and Waves in Space Plasmas*" of the International School of Space Science, L'Aquila (Italy), September 2007.

Member of ULTIMA (Ultra Large Terrestrial International Magnetic Array) since November 2007.

Referee of the following international scientific journals: *Journal of Geophysical Research, Geophysical Research Letters, Journal of Atmospheric and Terrestrial Physics, Annales Geophysicae, Studia Geophysica & Geodaetica, Annali di Geofisica*.

Participant to national and international conferences with invited contributions.

Author of 100 scientific publications (79 on refereed international journals).

Selected publications

Vellante M., K. Takahashi, A. Del Corpo, I. S. Zhelavskaya, J. Goldstein, I. R. Mann, E. Pietropaolo, J. Reda, and B. Heilig (2021). Multi-Instrument Characterisation of Magnetospheric Cold Plasma Dynamics in the 22 June 2015 Geomagnetic Storm. *J. Geophys. Res. Space Physics*, 126, e2021JA029292. https://doi.org/10.1029/2021JA029292

Del Corpo A., **M. Vellante**, B. Heilig, E. Pietropaolo, J. Reda, and J. Lichtenberger (2020). An empirical model for the dayside magnetospheric plasma mass density derived from EMMA Magnetometer Network Observations. *J. Geophys. Res. Space Physics*, 125, e2019JA027381, https://doi.org/10.1029/2019JA027381

Takahashi K., R.L. Lysak, **M. Vellante**, C.A. Kletzing, M.D. Hartinger, and C.W. Smith (2018). Observation and Numerical Simulation of Cavity Mode Oscillations Excited by an Interplanetary Shock. *J. Geophys. Res. Space Physics*, 123, 1969-1988, https://doi.org/10.1002/2017JA024639.

Vellante M., M. Piersanti, and E. Pietropaolo (2014). Comparison of equatorial plasma mass densities deduced from field line resonances observed at ground for dipole and IGRF models. *J. Geophys. Res. Space Physics*, 119(4), 2623-2633, doi:10.1002/2013JA019568.

Lichtenberger J., M.A. Clilverd, B. Heilig, **M. Vellante**, J. Manninen, C.J. Rodger, A.B. Collier, A.M. Jørgensen, J. Reda, R.H. Holzworth, R. Friedel, and M. Simon-Wedlund (2013). The plasmasphere during a space weather event: first results from the PLASMON project. *Journal of Space Weather and Space Climate*, 3, A23, doi: 10.1051/swsc/2013045.

Vellante M., M. Förster, U. Villante, T.L. Zhang, and W. Magnes (2007). Solar activity dependence of geomagnetic field line resonance frequencies at low latitudes, *J. Geophys. Res.*, **112**, A02205, doi:10.1029/2006JA011909.

Vellante M., and M. Förster (2006). Inference of the magnetospheric plasma mass density from field line resonances: A test using a plasmasphere model, *J. Geophys. Res.*, **111**, A11204, doi:10.1029/2005JA011588.

Vellante M., H. Lühr, T.L. Zhang, V. Wesztergom, U. Villante, M. De Lauretis, A. Piancatelli, M. Rother, K. Schwingenschuh, W. Koren, and W. Magnes (2004). Ground/satellite signatures of field line resonance: A test of theoretical predictions, *J. Geophys. Res.*, **109**, A06210, doi:10.1029/2004JA010392.

Vellante M., M. De Lauretis, M. Förster, S. Lepidi, B. Zieger, U. Villante, V.A. Pilipenko, and B. Zolesi (2002). Geomagnetic field line resonances at low latitudes: pulsation event study of 16 August 1993, *J. Geophys. Res.*, **107**(A5), 1060, doi:10.1029/2001JA900123.

Vellante M., U. Villante, M. De Lauretis, and G. Barchi (1996). Solar cycle variation of the dominant frequencies of Pc3 geomagnetic pulsations at L=1.6, *Geophys. Res. Lett.*, **23**, 1505-1508.

Vellante M., U. Villante, R. Core, A. Best, D. Lenners, and V.A. Pilipenko (1993). Simultaneous geomagnetic pulsation observations at two latitudes: resonant mode characteristics, *Annales Geophysicae*, **11**, 734-741.

Vellante M., and U. Villante (1991). Relationship between field line resonance at low geomagnetic latitudes and solar wind structures, *Geophys. Res. Lett*., **18**, 1501-1503.

Vellante M., U. Villante, M. De Lauretis, and P. Cerulli-Irelli (1989). An analysis of micropulsation events at a low-latitude station during 1985, *Planet. Space Sci.*, **37**, 767-773.

Vellante M., and A.J. Lazarus (1987). An analysis of solar wind fluctuations between 1 and 10 AU, *J. Geophys. Res*., **92**, 9893-9900.

Teaching activity

1996/97-2001/2002: Course on "Geomagnetism" (Degree in Physics), L'Aquila University.

2006/2007-2020/21: Course on "Physics of the Circumterrestrial Space" (Master degree in Physics), L'Aquila University.

2006/2007-2020/2021: Course on "Physics" (Degree in Informatics), L'Aquila University.

2009/2010-2010/2011: Course on "Physics" (Degree in Biology), L'Aquila University.

2015/2016-2020/2021: Course on "Physics" (Degree in Environment Sciences and Technology), L'Aquila University.

2020/2021: Course on "Space Weather" (Master degree in Atmospheric Science and Technology), L'Aquila University.

Lectures in international schools

"*Experimental aspects of low latitude ground pulsations*", Course on "Solar System Plasma Physics", International School of Space Science, L'Aquila (Italy), September 1993.

"*ULF field-line resonances in the Earth's magnetosphere*", Course on "Waves and Turbulence Phenomena in Space Plasmas", BG - URSI School, Kiten (Bulgaria), July 2006.

"*Geomagnetic Field Line Resonances: Ground-based Observations*", Course on "Turbulence and Waves in Space Plasmas", International School of Space Science, L'Aquila (Italy), September 2007.

"*Plasma diagnostics in the Earth's magnetosphere*", Course on "Astrophysical and Space Plasmas", International School of Space Science, L'Aquila (Italy), September 2012.

Participation to PhD academic boards

2004-2013: PhD in Physics at University of L'Aquila

2013-2021: PhD in Physical and Chemical Sciences at University of L'Aquila