

## CV of Davide Del Vento, Ph.D. in Physics

### TECHNICAL QUALIFICATIONS

- Expertise in design and performance analysis of algorithms and data structures.
- Experience in computational modeling, numerical methods and differential equations.
- Programming languages: fluency in C, Java, Fortran and Python.
- Shell programming: experience in bash, knowledge of ksh, csh, tcsh.
- Parallel frameworks: fluency in Java threads, MPI, OpenMP.
- Operating Systems: experience in AIX, Linux, UNIX system calls and tools like make, awk, sed.
- Version control: knowledge of git, subversion, mercurial, bazaar.
- Unit Testing Frameworks: experience in PyUnit, py.test, nose, JUnit, TestNG.
- Database: basic knowledge of PostgreSQL.
- Networking: knowledge of network protocols, layers and software stack.

### LEADERSHIP EXPERIENCE

- 2011 - current* Serves as chairman of UCAR's Software Engineering Assembly (SEA).
- 2010 - current* Serves as chairman of the SEA Seminar Committee. Organizes SEA seminars.
- 2011 - 2012* Envisioned and led the first SEA Conference.
- 2012 - current* Leads subsequent SEA Conferences.
- 2012* Planned and acted as facilitator in the first SEA code retreat.  
(see <http://sea.ucar.edu/> for details)
- 2006 - 2008* Served as vice president of the Italian Stereoscopic Society.
- 2008 - current* Honorary President of the Italian Stereoscopic Society.

### TEACHING AND MENTORING

- 2018* During summer, Will mentor 4 interns on Machine Learning for Long Term Weather Forecast and WRF performance analysis and optimization.
- 2011 - 2017* Mentored 12 interns, during the summers, on topics related to Parallel Debugging, Performance Analysis and Optimization, Python, Machine Learning, Compilers internals, WRF performance analysis and optimization.
- 2012 - current* Facilitates scholarships to allow students attending minority serving institutions of higher education to participate in the SEA Conferences.
- 2009 - 2014* Taught introductory classes for UCAR's postdocs, interns and staff on UNIX, Parallel Computing, MPI and OpenMP, Version Control, Python for scientists, Unit Testing in Python.

## RECENT EMPLOYMENT HISTORY

*Jan 2009 - current* **Software Engineer III**, at National Center for Atmospheric Research (NCAR).

- ✓ Collaborates with XSEDE Extended Collaborative Support Services (ECSS) and Novel and Innovative Projects (NIP), working with users on performance assessment and optimization, tuning, development and deployment of advanced, innovative software.
- ✓ Works on all-around WRF performance optimization, including OpenMP domain decomposition and single thread optimization
- ✓ Contributes to health, regression and performance testing of NCAR's clusters. Designs, develops, tests and maintains software for monitoring peak memory usage and clusters' performance. Contributes to analysis and troubleshooting of the systems in case of anomalous latency or availability issues, both on a daily basis and as part of deployment of new machines.
- ✓ Continues to carry out Software Engineer II duties described below

*Jan 2008 - Jan 2009* **Software Engineer II**, at National Center for Atmospheric Research (NCAR).

- ✓ Provided assistance to a community of about 2,000 scientists and programmers of NCAR's large-scale supercomputer clusters. Helped them on data structures, algorithms, serial and parallel performance assessment and optimization, porting, scalability, tuning, serial, OpenMP, and MPI debugging. Periodically taught one-day classes on various topics.
- ✓ Ported, compiled and installed serial and parallel software such as NetCDF, scalasca, Python, numpy/scipy on AIX and Linux clusters.
- ✓ Contributed to technical documentation about the supercomputers for scientists and programmers.

*Jan 2006 - Feb 2007* **Operation Manager**, member of the control team for the Visible InfraRed Thermal Imaging Spectrometer (VIRTIS) onboard the Venus Express mission of the European Space Agency (ESA). The mission was operational around the planet Venus from 2006 to 2014.

## EDUCATION

*2009* **Continuing Education** - University of Colorado at Boulder, Machine Learning, project "Cluster-based selective labeling for Support Vector Machines" (GPA:4.0)

- ✓ Original selective labeling strategy for SVM, not requiring to label a full dataset, while trying to preserve the good performance of SVM.

2004 May, 18 **Ph.D. in Physics** - “Roma Tre” University. Thesis: “Development and characterization of a quadrupole probe for planetary soil dielectric spectroscopy”

- ✓ Computational modeling for a capacitive instrument, proposed to ESA for the ExoMars planetary mission.

1999 Dec, 10 **Physics Degree** - “Roma Tor Vergata” University. Thesis: “Langevin equations with complex noise for reaction-diffusion systems” (score: 110/110)

- ✓ Numerical study of the Langevin stochastic differential equations.

### **PARTICIPATION IN PANELS**

January 2013 Invited panelist to the Town Hall Meeting: Why Python is the Next Wave in Earth Sciences Computing  
<https://ams.confex.com/ams/93Annual/webprogram/3PYTHON.html>

March 2012 Invited panelist on Collaborative Research Methodologies for Large Scale Computer Systems *2nd International Workshop on Adaptive Self-Tuning Computing Systems for the Exaflop Era*, 2012,  
<http://exadapt.org/2012/program.html>

### **PROPOSALS REVIEWS**

May 2015 Served on the review panel evaluating proposals to the *NASA ROSES 2014 element A.40 Computational Modeling Algorithms and Cyberinfrastructure (CMAC)* lead by Dr. Tsengdar Lee.

June 2012 Served on the Python committee evaluating proposals relevant for analysis, Python, workflow, and GPU type of work responding to the section 1.2.1 in *NASA ROSES 2011 element A.40 Computational Modeling Algorithms and Cyberinfrastructure (CMAC)*, lead by Dr. Tsengdar Lee

### **PAPERS**

- A. Fanfarillo, D. Del Vento, **Notified access in coarray-based hydrodynamics applications on many-core architectures: Design and performance**, *Parallel Computing, Elsevier*, 75, 2018, doi:10.1016/j.parco.2018.04.002
- D. Del Vento, E. Shook, A. Zonca, J. Wang **The GISandbox: A science gateway for geospatial computing**, *Software Engineering Assembly Conference*, Boulder, 2018.

- A. Fanfarillo, D. Del Vento, P. Nichols, **Optimizing Communication and Synchronization in CAF Applications**, *Advances in Parallel Computing, Volume 32*, 2017, doi:10.3233/978-1-61499-843-3-191
- A. Fanfarillo, A. Bouteiller, G. Bosilca, D. Del Vento, **Fault Detection in Fortran 2015 ExaMPI workshop at the Supercomputing Conference 2015**, *Institute of Electrical and Electronics Engineers*, Denver, 2017.
- A. Fanfarillo, D. Del Vento, **Notified access in coarray Fortran**, *Proceedings of the 24th EuroMPI/USA Group Meeting*, Chicago, 2017, doi:10.1145/3127024.3127026.
- S. Ghosh, D. Del Vento, et al. **Application performance impact on trimming of a full fat tree InfiniBand fabric**, *2nd IEEE International Workshop on High-Performance Interconnection Networks in the Exascale and Big-Data Era*, *Institute of Electrical and Electronics Engineers*, Barcelona, 2016.
- D. Jarecka, S. Arabas, D. Del Vento, **Python bindings for atmospheric numerical models**, *6th Symposium on Advances in Modeling and Analysis Using Python, 96th American Meteorological Society Annual Meeting*, New Orleans, 2016.
- N. Sobhani, D. Del Vento, et al. **Performance analysis, profiling and optimization of Weather Research Forecasting (WRF) Model**, *2nd Symposium on High Performance Computing for Weather, Water, and Climate, 96th American Meteorological Society Annual Meeting*, New Orleans, 2016.
- R. Kelly, S. Liu, S. Ghosh, D. Del Vento, D. Hart, D. Nagle, B.J. Smith, R. Valent, **Advanced user environment design and implementation on integrated multi-architecture supercomputers**, *Proceedings of the 2015 XSEDE Conference: Scientific Advancements Enabled by Enhanced Cyberinfrastructure*, St. Louis, MO, 2015, doi:10.1145/2792745.2792778
- S. Elliott, N. Sobhani, D. Del Vento, D. Gill, **WRF Performance Optimization Targeting Intel Multicore and Manycore Architectures** *96th AMS Meeting*, New Orleans, LA, 2016 (accepted).
- G. Fursin, R. Miceli, A. Lokhmotov, M. Gerndt, M. Baboulin, A. Malony, Z. Chamski, D. Novillo, D. Del Vento, **Collective mind: Towards practical and collaborative auto-tuning**, *Journal Scientific Programming*, Vol. 22 N. 4, 2014, doi:10.3233/SPR-140396
- C. Kruse, D. Del Vento, **Optimizing performance of the Weather Research and Forecasting model at large core counts: a comparison between pure MPI and hybrid parallelism and an investigation into domain decomposition**, *94th AMS Annual Meeting*, Atlanta, 2014, <https://ams.confex.com/ams/94Annual/webprogram/Handout/Paper237553/poster.pdf>

- D. Jarecka, S. Arabas, M. Fijalkowski, A. Jaruga, and D. Del Vento, **Object-oriented numerics with FOSS: comparing PyPy & NumPy, GCC/Clang & Bitz++ and Gfortran**, *EGU General Assembly 2013*. Geophysical Research Abstracts Vol. 15, EGU2013-12597-1, 2013.
- M. Lubin, S. McMillan, C. Kruse, D. Del Vento, and R. Montuoro **Full Scale Ahead: The Weather Research and Forecast (WRF) Model and Intel Cluster Studio XE 2013** *The Parallel Universe Magazine*, Issue 15, Intel, 2013
- A. Ashari, D. Del Vento, P. Sadayappan, **Machine Learning based Compiler Optimization**, *AGU Fall Meeting*, San Francisco, December 2012, <http://fallmeeting.agu.org/2012/eposters/eposter/in43c-1528/>
- D. Del Vento, **Performance optimization on a supercomputer with cTuning and the PGI compiler**, *Proceedings of the 2nd International Workshop on Adaptive Self-Tuning Computing Systems for the Exaflop Era*, 2012, doi:10.1145/2185475.2185477
- D. Del Vento, R. Montuoro, S. McMillian, M. Page, M. Lubin **Evaluation of Real-Forecast WRF Scaling Up to Tens of Thousands of Cores**, *2nd Annual Front Range High Performance Computer Symposium*, Fort Collins, August 13-14, 2012.
- R. Kelly, S. Ghosh, S. Liu, D. Del Vento, R. Valent, **The NWSC benchmark suite using scientific throughput to measure supercomputer performance**, *ACM SuperComputing 2011 State of the Practice Reports*, 2011, doi:10.1145/2063348.2063358
- D. Del Vento, T. Engel, S. Ghosh, D. Hart, R. Kelly, S. Liu, R. Valent, **System-level monitoring of floating-point performance to improve effective system utilization** *ACM SuperComputing 2011 State of the Practice Reports*, 2011, doi:10.1145/2063348.2063355
- D. Del Vento, M. Page, J. Rew, R. Mountuoro, **Performance and scaling of WRF and CCSM4 on Ranger, Hydra and Bluefire** *10th LCI International Conference on High-Performance Clustered Computing*, 2009.
- G. Piccioni, P. Drossart, et al., **First detection of hydroxyl in the atmosphere of Venus** *Astronomy and Astrophysics*, 483, L29-L33, 2008, doi:10.1051/0004-6361:200809761
- P. Drossart, G. Piccioni, et al., **A dynamic upper atmosphere of Venus as revealed by VIRTIS on Venus Express** *Nature*, 450(7170), 641-645 (November 2007), doi:10.1038/nature06140
- Piccioni, G., Drossart, et al., **South-polar features on Venus similar to those near the north pole**, *Nature*, 450(7170), 637-640 (November 2007)

- A. Cereti, G. Vannaroni, D. Del Vento, E. Pettinelli **Electromagnetic measurements on Martian soil analogs: Implications for MARSIS and SHARAD radars in detecting subsoil water** *Planetary and Space Science* Vol. 55, Issues 1-2 , pp.193-202, January 2007.
- E. Pettinelli, G. Vannaroni, E. Mattei, A. Di Matteo, F. Paolucci, A.R. Pisani, A. Cereti, D. Del Vento, P. Burghignoli, A. Galli, A. De Santis, F. Bella **Electromagnetic propagation features of ground-penetrating radars for the exploration of Martian subsurface**, *Near Surface Geophysics*, 2006, vol.1, pp. 5-11.
- D. Del Vento, A. Cereti **Soil Simulants Database and its Web Interface: design and implementation**, *IFSI Internal Report*, Roma, IFSI-2006-2, January 2006.
- D. Del Vento, G. Vannaroni **Evaluation of a mutual Impedance Probe to search for water ice in the Martian shallow subsoil**, *Review of Scientific Instruments*, 76, 084504 (2005) doi:10.1063/1.2009867
- G. Vannaroni, E. Pettinelli, A. Cereti, D. Del Vento, F. Paolucci **ACQUA-EMSS (Electromagnetic Measurements on Soil Samples)**, *WP1600 report October 2005 - ASI contract I/010/05/0*, *IFSI Internal Report*, IFSI-2005-32, October 2005.
- A. Cereti, G. Vannaroni, D. Del Vento **ACQUA-EMSS: Performance of MARSIS and SHARAD radars in detecting subsoil water**, *IFSI Internal Report*, Roma, IFSI-2005-19, July 2005.
- A. Cereti, D. Del Vento, G. Vannaroni, E. Pettinelli, F. Paolucci **ACQUA-EMSS: measurements of e.m. parameters on soil simulants**, *IFSI Internal Report*, Roma, IFSI-2005-15, May 2005.
- E. Pettinelli, G. Vannaroni, A. Cereti, A. R. Pisani, F. Paolucci, D. Del Vento, D. Dolfi, S. Riccioli, F. Bella **Laboratory investigations into the electromagnetic properties of magnetite/silica mixtures as Martian soil simulants**, *Journal of Geophysical Research - Planets*, 110, E04013 (2005) doi: 10.1029/2004JE002375
- G. Vannaroni, R. Filippini, E. Pettinelli, M. Storini, G. Della Monica, R. Di Maio, R. Orosei, C. Ottonello, S. Orsini, G. Tacconi, S. Pagnan, A. Galli, G. Schettini, A. Menghini, A.M. Di Lellis, D. Del Vento, F. Paolucci, A. Cereti **MuSES (Multisensor Soil Electromagnetic Sounding)**, *Planetary and Space Science*, 52, 67-78 (2004), doi:10.1016/J.PSS.2003.07.003
- A. Cereti, D. Del Vento, G. Vannaroni **Dielectric characterization of Mars soil analogues: dielectric spectroscopy of materials performed through**

**capacitive cells**, *IFSI Internal Report*, Roma, IFSI-2004-1, pp.1-28, January 2004.

- G. Vannaroni, E. Pettinelli, A. Cereti, D. Del Vento, F. Paolucci, A.R. Pisani, S. Riccioli **Permittivity and Permeability measurements on soil analogues to support the Mars-MuSES experiment**, *Proc. of the III European Workshop on Exo/Astrobiology. Mars, the search for life*, Madrid (Spain), 18-20 November 2003 (ESA SP-545, March 2004).
- G. Vannaroni, A.M. Di Lellis, D. Del Vento, A. Cereti, P. Baldetti **Soil Dielectric Spectroscopy Probe (SDSP): technical report**, *IFSI Internal Report*, Roma, IFSI-2003-15, pp.1-17, April 2003.
- G. Vannaroni, D. Del Vento **Soil Dielectric Spectroscopy Probe (SDSP) for the ExoMars rover mission**, *IFSI Internal Report*, Roma, IFSI-2003-11, pp.1-45, March 2003.

## POSTERS AND TALKS

- S. Elliott, D. Del Vento, **Performance Analysis and Optimization of the Weather Research and Forecasting Model (WRF) on Intel Multicore and Manycore Architectures**, *The International Conference for High Performance Computing, Networking, Storage and Analysis*, Austin, TX, November 2015 (accepted).
- N. Sobhani, D. Del Vento, D. Gill, S. Elliot, S. Vadlamani, **Performance Analysis, Profiling, and Optimization of Weather Research Forecasting (WRF) Model**, *Rocky Mountain Advanced Computing Consortium, HPC Symposium*, Boulder, CO, August 2015 (first place winner of the student poster competition).
- D. Del Vento, S. Vadlamani, J. Blomer, D. Nagle, **Fostering sound scientific practices within NCAR's software engineering community**, *95th AMS Annual Meeting*, Phoenix, AZ, January 2015.
- D. Del Vento, D. Jarecka, and S. Arabas, **Early experience on cloud microphysics modeling with Python**, *95th AMS Annual Meeting*, Phoenix, AZ, January 2015.
- D. Del Vento, G. Cervone, **Simulating a swarm of heterogeneous UAVs for Road Assessment during emergencies using the Yellowstone Supercomputer**, *95th AMS Annual Meeting*, Phoenix, AZ, January 2015.
- D. Jarecka, S. Arabas, M. Fijalkowski, A. Jaruga, and D. Del Vento, **Object-oriented numerics with FOSS: comparing PyPy & NumPy, GCC/Clang & Bitz++ and Gfortran**, *EGU General Assembly 2013*. Geophysical Research Abstracts Vol. 15, EGU2013-12597-1, 2013.
- A. Ashari, D. Del Vento, P. Sadayappan, **Machine Learning based Compiler Optimization**, *AGU Fall Meeting*, San Francisco, December 2012, <http://fallmeeting.agu.org/2012/eposters/eposter/in43c-1528/>
- D. Del Vento, R. Montuoro, S. McMillian, M. Page, M. Lubin **Evaluation of Real-Forecast WRF Scaling Up to Tens of Thousands of Cores**, *2nd Annual Front Range High Performance Computer Symposium*, Fort Collins, August 13-14, 2012.
- D. Del Vento, **Performance optimization on a supercomputer with cTuning and the PGI compiler**, *Proceedings of the 2nd International Workshop on Adaptive Self-Tuning Computing Systems for the Exaflop Era*, 2012, <http://exadapt.org/2012/program.html>
- D. Del Vento, M. Page, J. Rew, R. Mountuoro, **Performance and scaling of WRF and CCSM4 on Ranger, Hydra and Bluefire** *10th LCI International Conference on High-Performance Clustered Computing*, 2009.

- A. Cereti, G. Vannaroni, D. Del Vento, E. Pettinelli **Electromagnetic measurements on Martian soil analogs: implications for MARSIS and SHARAD radars in detecting subsoil water**, *VII Convegno Nazionale di Scienze Planetarie*, S. Felice al Circeo (Italy), 5-9 September 2006.
- E. Pettinelli, A. Di Matteo, F. Paolucci, F. Bella, G. Vannaroni, A. Cereti, D. Del Vento, E. Mattei, S. Riccioni, A. De Santis, A.P. Annan **Early-Time GPR Signal Analysis: Implications for Water Content Measurements**, *11th International Conference on Ground Penetrating Radar*, Delft (The Netherlands), 2-3 May 2005.
- A.M. Di Lellis, D. Del Vento, A. Menghini **Electronics engineering for the soil dielectric spectroscopy and time-domain electromagnetic sounding analysis in the frame of the ESA ExoMars Pasteur Rover mission**, *European Geophysical Society*, 2004.
- F. Paolucci, A.R. Pisani, A. Cereti, D. Del Vento, L. Marinangeli, D. Dolfi, G. Vannaroni, E. Pettinelli **Dielectric spectroscopy of dry and wet volcanic rocks as Martian analogues**, *International Mars Conference*, Ischia Island (Italy), 19-23 September 2004, poster 17.
- E. Pettinelli, G. Vannaroni, A. Galli, A. Cereti, D. Del Vento, A.R. Pisani, F. Paolucci, E. Mattei, A. Di Matteo, S. Riccioli, F. Bella **Electromagnetic characterization of Martian soil for GPR subsurface exploration**, *International Mars Conference*, Ischia Island (Italy), 19-23 September 2004, poster 14.
- A. Cereti, D. Del Vento, G. Vannaroni, E. Pettinelli, M. Storini **Electromagnetic characterization of iron oxide/silica mixtures in the frequency domain 1kHz - 32MHz**, *International Mars Conference*, Ischia Island (Italy), 19-23 September 2004, poster 13.
- E. Pettinelli, A.R. Pisani, A. Di Matteo, F. Paolucci, F. Bella, G. Vannaroni, A. Cereti, D. Del Vento, A. Galli, E. Mattei, A. De Santis **Electromagnetic Features of Ground Penetrating Radars for the exploration of Martian subsurface**, *10th International Conference on Ground Penetrating Radar*, Delft (The Netherlands), 21-24 June 2004.
- G. Vannaroni, E. Pettinelli, A. Cereti, D. Del Vento, F. paolucci, A.R. Pisani, F. Bella, M. Storini, S. Riccioli **Complex permittivity and permeability measurements on Martian soil analogues, to support data interpretation of GPR experiments**, *35th Committee on Space Research - COSPAR Paris (France)*, 18-25 July, 2004.
- A. Cereti, E. Pettinelli, A.R. Pisani, A. Galli, P. Burghignoli, D. Del Vento, G. Vannaroni, F. Ticconi **Features of Ground Penetrating Radar for the Exploration of Planetary Subsurface**, *XV Canary Islands Winter School of*

*Astrophysics - Payload and Mission Definition in Space Sciences*, Tenerife (Spain), 17-28 November 2003 .

- D. Del Vento, G. Vannaroni, A. Cereti, M. Storini **Soil Dielectric Spectroscopy Probe for Mars Soil Characterization**, *XV Canary Islands Winter School of Astrophysics - Payload and Mission Definition in Space Sciences*, Tenerife (Spain), 17-28 November 2003 .
- E. Pettinelli, P. Burghignoli, A. Galli, A.R. Pisani, F. Ticconi, D. Del Vento, A. Cereti **Electromagnetic propagation modelling for GPR exploration of Martian subsoil**, *hird Mars Polar Science Conference*, 8080.pdf.
- D. Del Vento, G. Vannaroni, M. Storini **SDSP-ACQUA**, *European Geophysical Society, Geophysical Research Abstracts*, Vol.5, 09371, 2003.
- D. Del Vento, G. Vannaroni **SDSP - ACQUA, strumento per la misura della permittivit complessa per la caratterizzazione di un suolo planetario**, *Workshop Contributo dei giovani ricercatori alla Geofisica Applicata in memoria del Prof. Antonio Tramacere, Dip. Geologia e Geofisica, Universit di Bari (Italy) 13-14 February 2003*.
- G. Vannaroni, D. Del Vento, M. Storini, G. Della Monica, A. Cereti, F. Paolucci **SDSP (Soil Dielectric Spectroscopy Probe)**, *Workshop on Exploring Mars Surface and its Earth Analogues, Sicily and Mount Etna (Italy) 23-25 September 2002*.
- G. Vannaroni, R. Filippini, E. Pettinelli, M. Storini, G. Della Monica, R. Di Maio, R. Orosei, C. Ottonello, G. Tacconi, S. Orsini, S. Pagnan, A. Galli, G. Schettini, A. Menghini, A.M. Di Lellis, D. Del Vento, F. Paolucci, A. Cereti **MuSES (Multi-sensor Soil Electromagnetic Sounding)**, *Workshop on Exploring Mars Surface and its Earth Analogues, Sicily and Mount Etna (Italy) 23-25 September 2002*.
- G. Vannaroni, R. Filippini, E. Pettinelli, M. Storini, G. Della Monica, R. Di Maio, R. Orosei, C. Ottonello, G. Tacconi, S. Orsini, S. Pagnan, A. Galli, G. Schettini, A. Menghini, A.M. Di Lellis, D. Del Vento, F. Paolucci, A. Cereti, A. Pisani **Multi-sensor Soil Electromagnetic Sounding (MuSES) for Mars exploration**, *Proceedings of the 2nd European Workshop on Exo/Astrobiology, Graz (Austria), 16-20 September 2002 (ESA SP-518, November 2002)*, pp.327-330.