EUROVOLC Virtual Access to computational tools at INGV Pisa

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Virtual Accesses

Abstract. *While computational capabilities in volcano science are developing to progressively higher sophistication levels involving HPC, parallel programming, and extensive use of super-computers, there is an increasing demand for accessibility to low to intermediate-level models and codes that can support multi-disciplinary research carried out by experts other than physical modelers and code developers. Responding to such a need by the international community is the justification and objective of Virtual Access (VA) activities developed under the EUROVOLC project. The Volcano Dynamics Computational Centre (VDCC) at INGV Pisa is renown as one international leader in physical-mathematical modelling and numerical simulation of volcanic thermo-fluid dynamics processes occurring from the deep regions of magma rise and accumulation within the crust, to within the atmosphere during volcanic eruptions. VDCC has been developing a large set of computational tools during last 30 years, that are offered under EUROVOLC for Transnational Access (for the most sophisticated, computational demanding models and codes) as well as for VA for low to intermediate-level models and codes. The latter include from non-ideal, compositional-dependent, multi-component volatile-melt thermodynamics to steady-state magma ascent to fast-performing kinematic modelling of pyroclastic density currents. Here we illustrate the model capabilities, the procedures to both download the codes and perform web-based computation, and a few relevant examples of calculations available through VA, and show relevant statistics of access and download by the volcano community to-date.*

EUROVOLC Virtual Accesses offer the opportunity to anyone with a web access to use online tools related to volcanological research. The *Volcano Dynamics Computational Center* at INGV in Pisa offers the access to a suite of fast-performing numerical codes aimed at modeling different aspects of volcano dynamics:

solwcad: Fortran code that computes the fully non-ideal, multi-component, compositional-dependent saturation surface of H_2O+CO_2 in silicate melts over P-T-composition conditions relevant to magmatism and volcanism. Calculations allow to either 1) determine the partition of H_2O and CO_2 between the melt and gas phase, or 2) determine the entrapment pressure and corresponding gas phase composition from dissolved amounts;

MAMMA: FORTRAN90 code designed to solve a conservative model for magma ascent in a volcanic conduit, described as a compressible multi-component two-phase flow. The system of conservation equations considers the effects of the main processes that magmas experience during ascent, such as crystallization, rheological changes, fragmentation, physical interaction with conduit walls, out-gassing and degassing. The model is capable of describing conduits with elliptical cross sections and depth-dependent dimensions;

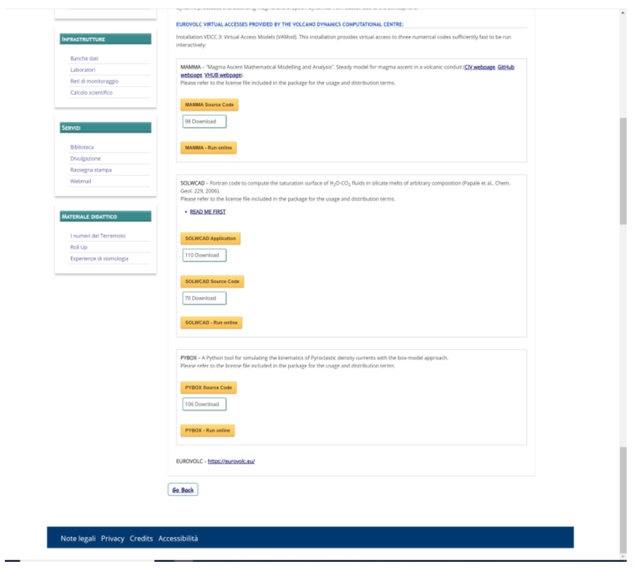
PyBOX: Python/Fortran90 code that solves the so-called "box model" equations describing the kinematics of a pyroclastic density current over a flat surface and in a steady atmosphere. The model integrates a procedure to account for blockage of PDCs by a rugged topography imported as a ASCII file, by adopting the so-called "energy-conoid" approach. Virtual Access will include an interface to import the DEM file and input parameters and to visualize georeferenced maps of invasion and plots of decaying dynamic pressure.

Volcano Dynamics Computational Center Web Access

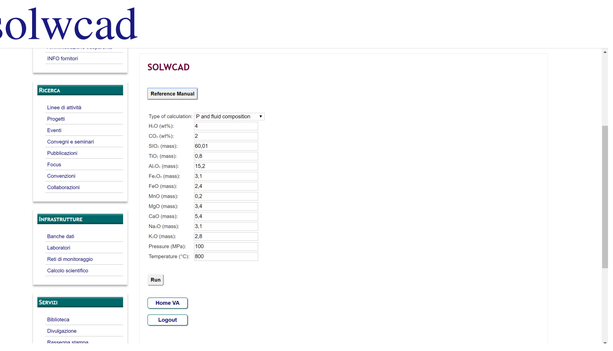
`www.pi.ingv.it`

EUROVOLC introduction and description of accesses to VDCC

Virtual Access: users can select the code they want to use, and how to use it

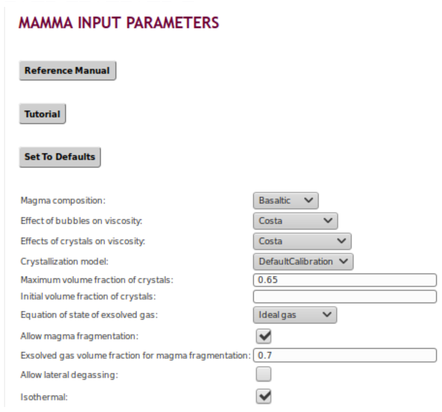


solwcad



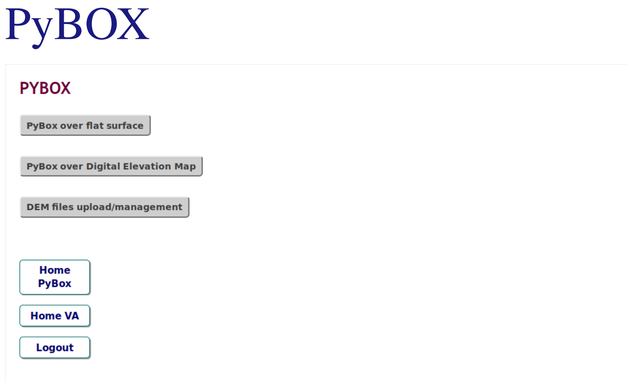
- detailed manual;
- run simulations online, download code or download routine to add to own code;
- results for online runs obtained within seconds on the same web page.

MAMMA



- detailed manual and link to GitHub repository;
- run simulations online or download code;
- online runs may last minutes, therefore results are sent by email and include figures.

PyBOX



- detailed manual;
- run simulations online in different conditions, or download code;
- results for online runs obtained within seconds on the same web page.

Usage Statistics