Thermo Fisher
SCIENTIFIC

PerGeos Software version 2022.2

Release notes

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Contents

Introduction

This document covers the most important new features, improvements, and changes in this version of Thermo Scientific™ PerGeos Software. In addition, you will find a list of new Xtras including video tutorials, recipes, and workflows which have been published on **pergeos.com** since the previous release.

We value your feedback. If you encounter any problems or have any suggestions for improvement, do not hesitate to **contact us.**.

Enhancements and new features

Two-phase flow visualization

This new tool enables the visualization of the invasion sequence produced by the Two-Phase Flow Simulation tool, and provides a visual support when interpreting or communicating the results. Two-phase flow is the simulation of concurrent flow of two immiscible fluids inside porous materials. This new tool uses the result of the PerGeos Two-Phase Flow Simulation to display the evolution of the state of each pore and throat at any given time. Using the default colormap, the color-code is the following:

- Pale blue, Wetting Phase (e.g. water)

- Blue, Non-Wetting Phase (e.g. oil)

- Red, Trapped Wetting Phase (e.g. trapped water)

- Green, Trapped Non-Wetting Phase (e.g. trapped oil)

OS requirements: All supported platforms

Licensing: Pore Network Flow Extension

Meshing

- Run-time performance of the mesh generation algorithm, in the Meshing workroom, has been significantly increased, with a computation time almost divided by a factor 2. The generated meshes have, as far as tested, better quality and tend to contain slightly more tetrahedra. Memory requirements remain similar.

- Mesh file formats supported for CAE/CFD/FEA interoperability have been updated. Among others, the file formats ABAQUS until 2022, ANSYS until 2022 and COMSOL 5.6 are supported.

OS requirements: Windows only
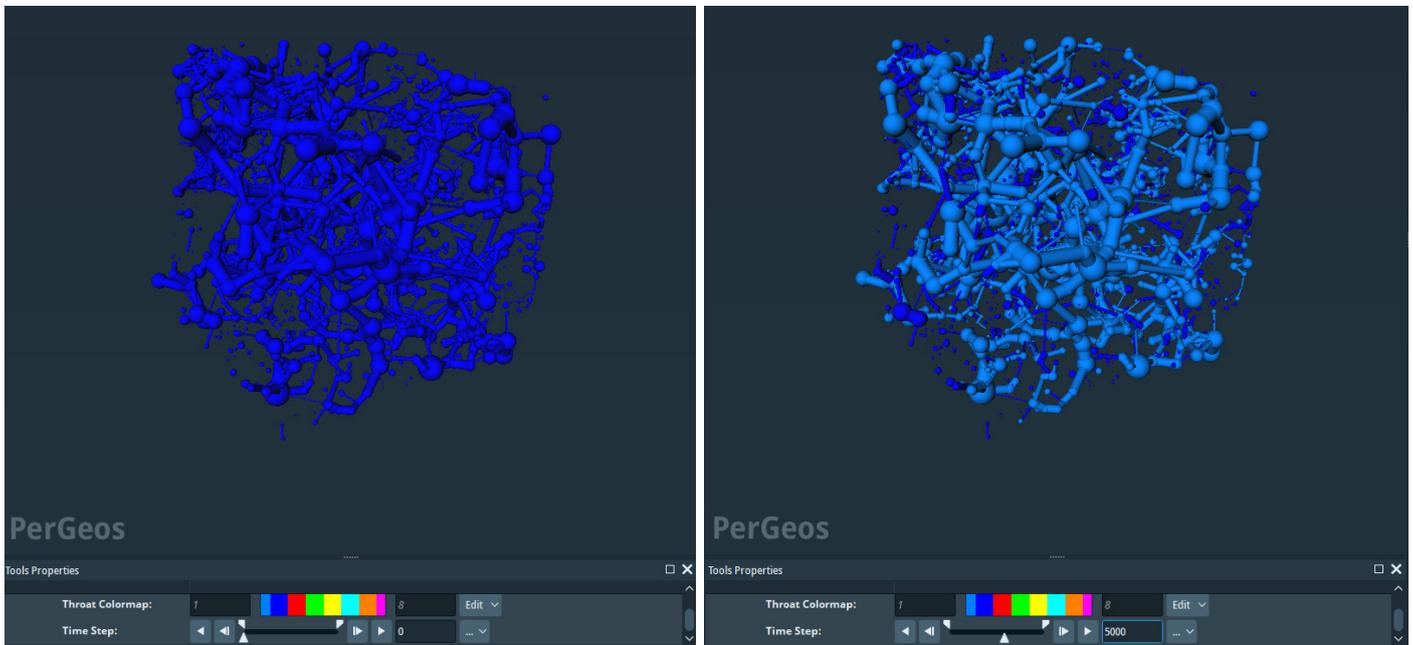
Licensing: No restriction

Figure 1. Visualization of the network state of the invasion experiment (top) at the initial state, (bottom) near the end of the water injection stage.
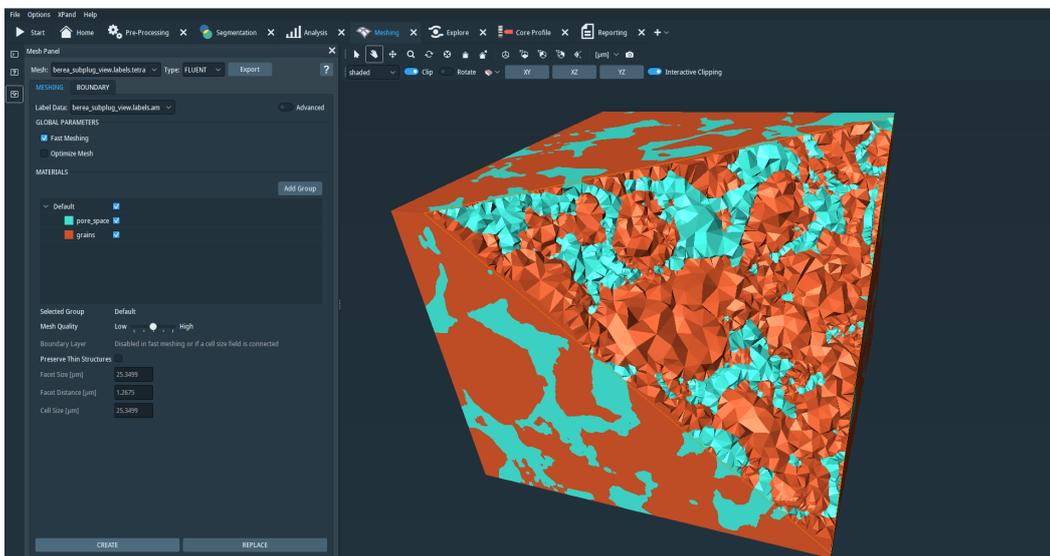

Figure 2. Tetrahedral mesh of a sandstone sample.

New tool: Thickness Map

With the 2022.1, we changed the algorithm that was used by the Simulated Mercury Injection tool. Despite being faster, more robust, and producing more accurate results, this tool was no longer producing a distance map output that was useful to understand the mercury injection. It is now possible to obtain this map once again, by explicitly using the new Thickness Map tool. Keep in mind that the result may differ slightly when comparing result from the old Simulated Mercury Injection due to computational precision.

OS requirements: All supported platforms

Licensing: No restrictions

User Interface improvements

The following modules have been greatly improved in term of performance in the 2022.1 version:

- Beam Hardening Correction
- Ring Artefact Removal
- Cylindrical Intensity Profile

The user experience of these tools have been enhanced in this 2022.2 version; for example, by incorporating a threshold range displaying the data histogram and an interactive component to define the centerpoint.

OS requirements: All supported platforms
Licensing: No restrictions

Xtra recipe library

The following Xtras have been published or updated since the previous release notes. Pay particular attention to the product, license and OS requirements, as well as the installation instructions. Your feedback is welcome.

Cylinder Slice with Native Resolution in Z (Update): This Xtra module is a version of the Cylinder Slice module that sets the resolution, in the Z direction, of the extracted image to the native resolution of the input data.

BSE SEM denoiser (Update): U-Net model for denoising back-scattered SEM images.

Getting Started with Deep Learning Training for Image Segmentation (Update): Model and companion project for the Deep Learning tutorial.

How to Install the Deep Learning Python Environment (Update): Two videos explain how to install the dependencies needed to use Deep Learning within Amira 3D, Avizo 3D, or Pergeos. One video covers the standard install and the other is for users without an Internet connection.
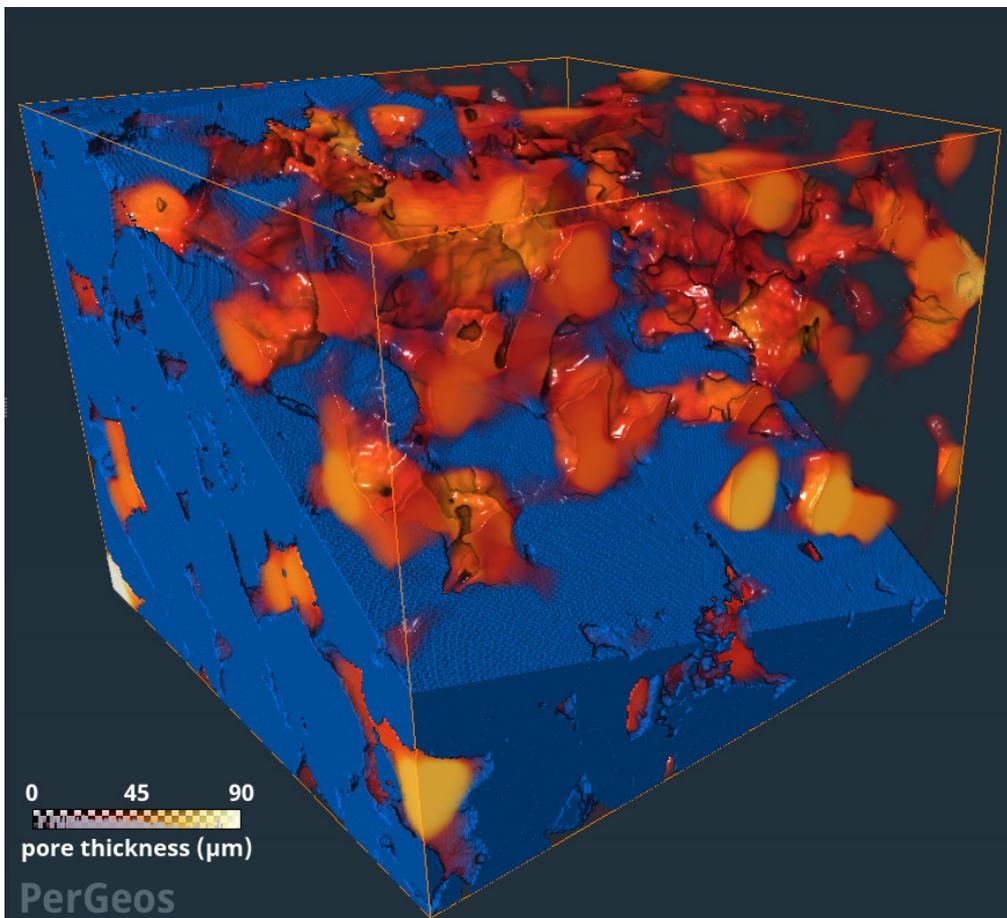

Figure 3. Thickness Map of pore space in sandstone sample

Compatibility notes

DICOM Export/Import of dicomseg: PerGeos is now able to read DICOM files using Transfer Syntax UID : 1.2.840.10008.1.2.5 (RLE Lossless). An update of the DCMTK 3rd party library (to version 3.6.3) fixed a bug occurring when writing DICOM files of "Segmentation Storage SOP" class (dicomseg). These files, despite being readable with previous versions of PerGeos, were not respecting the DICOM standard. This upgrade and fix causes a compatibility break in PerGeos: dicomseg files written with previous versions of Pergeos will be no longer be read properly with 2022.2 version. To work around this issue, you must load the old dicomseg file in a previous version of PerGeos (e.g. 2022.1), and save it in .am file format. Then, please load this .am file with version 2022.2, and export it as a DICOM file to obtain a dicomseg file conforming with DICOM standard.

XPand developers: Compilers required to build PerGeos applications' extensions based on XPand API are:

- Microsoft Visual Studio 2019 on Windows

- gcc 9 on Linux OS

PerGeos users who have developed custom extensions based on XPand API must rebuild their extensions using the new supported compilers.

Import of 16-bit PNG files: In previous versions, loading a 16-bit PNG was resulting in an 8-bit dataset in PerGeos, with intensity values remapped from their initial dynamic to the [0, 255] range. Following an upgrading of our 3rd party Qt, to version 5.13.0, native support for 16-bit grayscale images is now possible. As a result, 16-bit PNG files are now read as 16-bit images in PerGeos without any intensity remapping anymore. Users who wish to maintain compatibility can use the tool "Convert Image Type" to perform the intensity remapping

explicitly. Images which use a significant range of gray values are mostly unaffected, but images which only had a few of them will see changes in the way that colors are interpolated during the conversion process. See **Figure 4** for the same 4 images loaded with this change.

Documentation and distant executable: Running PerGeos on a local pc via an executable stored on a remote PC accessible via LAN requires that the environment variable QTWEBENGINE_DISABLE_SANDBOX be set to 1 in order to access the product documentation.

NetCDF file format support: Some metadata stored in .nc files and that were available in the Parametric bundle after loading an .nc file in the previous version are no longer available. However, the main geometric information and image data are unchanged.

XPand extension requirements

To add custom extensions with PerGeos XPand extension, you will need:

- Microsoft Visual Studio 2019 version 16.2 (v142) on Windows

- gcc 9.x on Linux Ubuntu 20.04

- As of this release the Eigen library is no longer distributed with PerGeos and it is therefore necessary to explicitly install it to compile any XPand tools that make use of it.

PerGeos users who have developed custom extensions based on XPand API must rebuild their extensions using the new supported compilers.
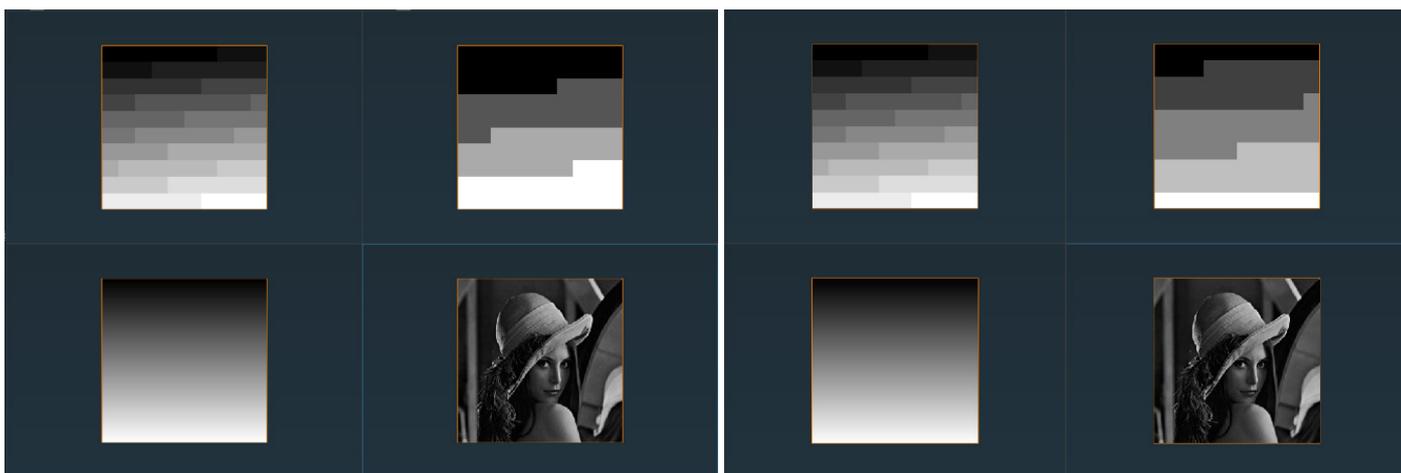

Figure 4. On the left are 16-bit images loaded with PerGeos 2022.1; on the right are the same images loaded by PerGeos 2022.2.

End of support

CentOS7, replaced by Ubuntu 20.04 as official Linux distribution

CentOS7 is discontinued starting from this release. It is replaced by Ubuntu 20.04 as the officially supported Linux platform. PerGeos 2022.1 was the last officially maintained release on CentOS7 platform. There will be no new product development nor update on CentOS7 after that version. We encourage you to transition to the Linux-supported platform to benefit from our full support.

CUDA on Windows 7 / Windows 8

As already announced, MS Windows 7, MS Windows 8 and MS Windows 8.1 operating systems support has been discontinued (since release 2020.3). Anyway PerGeos can be used on those OSs without major issues. Starting from this release a third party update causes all CUDA based functionalities (Deep learning tools, Ambient occlusion, Anisotropic diffusion and Non-Local means filter - GPU Adaptive Manifold) to not be functional anymore on these platforms. We encourage you to update your Operating system to a Windows-supported platform in order to benefit from our full functionalities.

Operating systems

PerGeos Software version 2022.2 runs on:

- Microsoft Windows 10 (64-bit).

- Linux x86 64 (64-bit). Supported 64-bit architecture is Intel64/AMD64 architecture.
  Supported Linux distribution is Ubuntu 20.04 (desktop).

Resolved issues

Name	ID	Description
Linux platform	AA-11419	The SELinux environment does not cause startup error anymore
LDA	AA-12356	It is now possible to open LDA files issued from big stack of jpeg2000 files without error
DICOM	AA-23716	When exporting a dicom file, the pixel spacing tag is now saved with the correct unit
VGL Reader	AA-25349	TIFF stack data is now imported with the correct size and voxel size
VGL Writer	AA-26631	Projects containing VGL files which reference a great number of images can now be correctly saved and exported in both hx and togo formats
Colormap Editor	AA-27104	Colormap conversion has been fixed to avoid incoherence in color value
Label Analysis	AA-27394	Computing a label image containing negative values does not raise an error anymore
TIFF reader	AA-27462	RGB TIFF file with slice greater than 30.000x30.000 are now loaded without error
Deep Learning Prediction	AA-27475	Large Data are now successfully processed by deep learning prediction
Generate Surface	AA-27528	The Smoothing Extent port is now limited to 3 (limitation of the algorithm)
Intensity Auto Classification	AA-27790	Using the module on large datasets with a high Pre-Computing (%) value now works as expected
Simulated Mercury Injection	AA-27714	The Thickness Map is now available in PerGeos to calculate the thickness map which is no longer automatically calculated by the Simulated Mercury Injection module from version 2022.1

Learn more at **thermofisher.com/pergeos**

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