**Title:** T2Well-ECO2M software: implementation of an operative manual, inclusive of specific case studies, to describe the new improvements carried out at DICAM

**Scope of the research**

The coupled wellbore-reservoir flow simulator T2Well has been developed at the Lawrence Berkeley National Laboratory (LBNL, USA) for modeling well-reservoir processes under transient, multiphase and non-isothermal conditions (1).

Basically, T2Well includes in TOUGH2 (2) transient wellbore flow modeling capabilities by using the Drift Flux Model suitable for 1D multiphase flow in cylindrical or annular pipes, either vertical or inclined. As an extension of TOUGH2, T2Well can be coupled to different Equation of State (EOS) modules.

Recently at LBNL T2Well has been further extended and the new research code T2Well-ECO2M (3) has been developed. T2Well-ECO2M has been delivered to DICAM within the ongoing informal collaboration between DICAM and LBNL. Over the last period, DICAM has worked extensively on the source code of this new software (4).

T2Well-ECO2M allows coupled 3-phase wellbore reservoir flow modelling by using the EOS ECO2M V.2 with the main goals to simulate:

- the dynamics of CO2 injection and leakages through wellbores linked to GHG geological sequestration in saline aquifers;

- the dynamics of CO2 multiphase flow in injection and production wellbores in EGS exploitation at high temperatures.

Considering that T2Well-ECO2M is a research code still under development, a user’s guide for it is not yet available. Therefore, many of its recent changes and improvements are only documented as comments of the source code or are spread in technical reports, and this is a strong limitation for the routinely use of the code. Also, specific case studies to be used for training on its use are not yet available.

Therefore, the scope of the research project is to collect all the available information on T2well-ECO2M, from an in-depth research inside its source code and from the available reports and to create an organic operative manual for it. The manual must include a specific part with a couple of well documented and explained case studies to be used as examples for training of the user.

**Activity plain**

Most activities will be performed at DICAM, some parts could be performed in remote.

Analysis of the source code of T2well-ECO2M (from 1˚ to 2˚ month);

Analysis of the technical reports on T2well-ECO2M available at DICAM (from 3˚ to 4˚ month);

Design and testing of specific case studies (from 5˚ to 6˚ month);

Editing of the final manual (from 7˚ to 12˚ month);

References

1. L. Pan, C.M. Oldenburg. T2Well - An integrated wellbore–reservoir simulator. Computers & Geosciences, 65, 46–55, 2014.
2. K. Pruess, C.M. Oldenburg, G.J. Moridis. TOUGH2 User's Guide Version 2. Report, LBNL-43134, 1999.
3. C.M. Oldenburg, L. Pan, L. Dobeck, L. Spangler. On producing CO2 from subsurface reservoirs: simulations of liquid-gas phase change caused by decompression. Greenhouse Gas Sci Technol., 9,194–208, 2019.
4. K. Strpic., A. Battistelli, S. Bondua', V. Bortolotti, P. Macini, L. Pan, [Modeling of Transient Multiphase Flow in a CO2 Injection Well with the Wellbore-Reservoir Coupled Simulator T2Well-ECO2M](https://cris.unibo.it/handle/11585/798421), in: Proceedings 1st EAGE Geoscience & Engineering in Energy Transition Conference, 2020, pp. 1 – 5, 2020