**Reviewer #6:** The paper is good and worthy explaining the finite element analyses of the twin circular tunnels deformation mechanisms taking into account the visco-elasto-plastic behavior of the surrounding rocks. the following comments are suggested:

**\*1- Title of the paper may be revised as the numerical modelling analyses are based on the FEM. For example the following title is suggested: "A three-dimensional finite element analysis of the rock deformation mechanisms in twin circular tunnels with a transverse gallery based on visco-elasto-plastic constitutive models".**

Thank you for your suggestion regarding the title. After careful consideration, we have decided to adopt the title proposed by the other reviewer: "Evaluation of Rock Deformation in Twin Tunnels with a Transverse Gallery, Considering Plasticity and Time-Dependent Constitutive Models." We believe this title aligns well with the focus and scope of the study while maintaining clarity and conciseness.

**\*2- The English of the abstract may be rechecked. Some lengthy and somewhat repetitive sentences exist.**

Thank you for your suggestion to improve the English in the abstract. We have carefully revised the abstract to address the issues of lengthy and repetitive sentences. The updated version is provided below for your review:

“Resorting to a three-dimensional finite element framework, the paper investigates the instantaneous and long-term deformation in twin tunnels with connecting transverse gallery. Emphasis is dedicated to the combined effects of time-dependent materials behavior, twin tunnels proximity, and tunnel junctions on the convergence profile. At the material level, the rock's mechanical behavior is modeled through coupled plasticity-viscoplasticity, suitable for deep clayey rocks. As regards the lining concrete, the creep deformation is represented by an aging viscoelastic model based on Bažant and Prasannan's Solidification Theory, while the shrinkage deformation component is based on the formulation proposed in the CEB-FIP MC90 standard. At the structure level, the excavation and lining installation are simulated through the activation-deactivation technique. The model's accuracy is assessed through comparisons with available analytical stress solutions for simplified twin tunnel configurations. The numerical simulations have notably emphasized the deformation anisotropy induced by tunnels proximity, the peak convergence values observed at tunnel-gallery junction as well as the crucial role of time-dependent properties of concrete lining in controlling the tunnel deformation.”

**\*3- The theoretical background and literature review on the stress analyses around rock tunnels may be improved. For example see the following papers:**

N Nikadat, MF Marji, 2016, Analysis of stress distribution around tunnels by hybridized FSM and DDM considering the influences of joints parameters, Geotechnical and Geological Engineering 11 (2 (April 2016)), 269-288.

<https://doi.org/10.12989/gae.2016.11.2.269>

M. S. Abdollahi, M. Najafi, AR Yarahmadi Bafghi, MF Marji, 2019, A 3D numerical model to determine suitable reinforcement strategies for passing TBM through a fault zone, a case study: Safaroud water transmission tunnel, Iran,Tunneling and Underground Space Technology 88, 186-199.

<https://www.sciencedirect.com/science/article/pii/S0886779818305078>

A Abdollahipour, MF Marji, AY Bafghi, J Gholamnejad, 2016, Time-dependent crack propagation in a poroelastic medium using a fully coupled hydromechanical displacement discontinuity method, International Journal of Fracture 199, 71-87.

<https://link.springer.com/article/10.1007/s10704-016-0095-9>

A Abdollahipour, MF Marji, AY Bafghi, J Gholamnejad, 2016, A complete formulation of an indirect boundary element method for poroelastic rocks, Computers and Geotechnics 74, 15-25.

<https://www.sciencedirect.com/science/article/pii/S0266352X15002748>

Thank you for your thoughtful suggestions regarding the theoretical background and literature review. While the recommended papers provide valuable contributions to the broader field of stress analyses in rock tunnels, the scope of our introduction was intentionally focused on applications involving twin tunnels, as this is the primary subject of the study. This approach aimed to maintain the relevance and coherence of the literature review with the specific objectives of our research. We appreciate the relevance of your suggested references to the general field and will consider citing them in future work where the broader context of tunnel mechanics and stress analyses is explored. However, the citation of the first and last article was incorporated in the second item of the Fundamental Assumptions:

“Although material heterogeneity and behavior anisotropy are inherent features of soils and rocks, the rock mass is modeled throughout the paper as a homogeneous and isotropic continuous medium. At the scale adopted for tunnel modeling (macroscopic scale), this assumption means in particular that the possible micro-heterogeneities, such isotropic distributions of joints or cracks present at the finer scale, are accounted for in the homogenized behavior by means of a preliminary homogenization process (e.g., Nemat-Nasser and Hori 1993, Deudé et al. 2002, de Buhan et al. 2002, Marmier et al. 2007, Aguiar and Maghous 2023). Clearly enough, the framework of continuum modeling adopted in the paper would reveal questionable when the rock mass is cut by a few macroscale fracture joints. Examples of studies dealing with macro-scale fracturing in tunnels are Nikadat and Marji 2016 and Abdollahipour et al. 2016.”

**\*4 - The explanations for Figures' captions may be improved, For example the caption of Figs. 11 is very concise. It may be divided into two parts (a) and (b) for the two figs, and explain them individually., The same is true for Figs. 19 and Figs. 20, etc..**

Figure 11 has been modified to indicate a) and b), with the legend:

“Fig.11. Schematic representation of the excavation and lining installation process in the a) longitudinal tunnel and b) transverse gallery.”

The legend of the Figure 19 has been modified to:

“Fig. 19: The plastic zone extent obtained from the present F.E. simulations and from the stress solution provided in Ma et al. 2020 considering different rock cohesion values and initial stress states.”

Figure 20 has been modified to indicate a), b) and c), with the legend:

“Fig 20: Comparison between F.E. simulations and the analytical solution by Ma et al. 2020 for radial and orthoradial stress components along different radial paths: a) theta 45, b) theta 90 and c) thetha 135.”