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Tinamit: Making coupled system dynamics models accessible to stakeholders

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Model coupling is increasingly used as a method of combining the best of two models when representing socio-environmental systems, though barriers to successful model adoption by stakeholders are particularly present with the use of coupled models, due to their high complexity and typically low implementation flexibility.
Coupled system dynamics - physically-based modelling is a promising method to improve stakeholder participation in environmental modelling while retaining a high level of complexity for physical process representation, as the system dynamics components are readily understandable and can be built by stakeholders themselves. However, this method is not without limitations in practice, including 1) inflexible and complicated coupling methods, 2) difficult model maintenance after the end of the project, and 3) a wide variety of end-user cultures and languages.
We have developed the open-source Python-language software tool Tinamit to overcome some of these limitations to the adoption of stakeholder-based coupled system dynamics - physically-based modelling. The software is unique in 1) its inclusion of both a graphical user interface (GUI) and a library of available commands (API) that allow users with little or no coding abilities to rapidly, effectively, and flexibly couple models, 2) its multilingual support for the GUI, allowing users to couple models in their preferred language (and to add new languages as necessary for their community work), and 3) its modular structure allowing for very easy model coupling and modification without the direct use of code, and to which programming-savvy users can easily add support for new types of physically-based models.
We discuss how the use of Tinamit for model coupling can greatly increase the accessibility of coupled models to stakeholders, using an example of a stakeholder-built system dynamics model of soil salinity issues in Pakistan coupled with the physically-based soil salinity and water flow model SAHYSMOD. Different socioeconomic and environmental policies for soil salinity remediation are tested within the coupled model, allowing for the identification of the most efficient actions from an environmental and a farmer economy standpoint while taking into account the complex feedbacks between socioeconomics and the physical environment.