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COMPUTATIONAL METHODS FOR DEEP SEA MINING OR SAMPLING APPLICATIONS

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ABSTRACT

Urbanization, the shift from fossil fuels to electricity in heating and transportation, and the rise of digitalization are driving up the need for important raw materials such as copper, cobalt, rare earth metals, and trace metals. For example, industries like power grid expansion, electric engines, wind turbines, and solid-state batteries heavily rely on copper. The demand for copper in these sectors is projected to more than double by 2035.

In the deep-sea with depths of around 1000-4000 m, major deposits of rare mineral in the form of massive sulphides are found locally limited primarily to tectonic zones and fault lines. This boosts the development of new sampling or mining approaches to increase copper ore supply for example. On the other hand, deep sea ecosystems are fragile and mining operations have to induce the lowest possible footprint which requires special care during the development process.

Due to the challenging boundary conditions of the environments in the deep sea, experimental verification and validation of the mining device and subcomponents under realistic conditions are significantly challenging. This necessitates the usage of computational methods to test and validate components of the mining device or even to come up with a model digital twin of the entire setup to assure the functionality during the costly and complex mining missions in deep-sea conditions. This session addresses all computational methods relevant for this kind of undertaking. The topics of interest include, but are not limited to, CFD of multiphase flows, particle transport and separation, sea floor modelling (DEM), structure mechanics (FEM), fluid-structure-interaction, handling and operation, positioning and location detection in deep sea applications.

REFERENCES

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