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Metamorphic methane degassing: questions and challenges

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Metamorphic fluids have been central in the evolution of our planet and may also control the evolution and habitability of other planetary bodies. Although a large body of literature has focused on metamorphic carbon dioxide (CO₂), from its sources to its emissions into the atmosphere, methane (CH₄) may also be a fundamental species in metamorphic fluids in a large variety of rock systems and produced through multiple processes. However, the geology of metamorphic methane is still largely unexplored.

This study centers on metamorphic methane formation and transformation through a variety of processes and chemical systems from literature data and unpublished results, including open and closed systems in meta-sedimentary, meta-basic, and meta-ultrabasic rocks. Particular attention will be given to the types of methane that may be formed in metamorphic rocks and their classification, their distribution and abundance, and their abiotic or biotic interpretations.

This contribution highlights the importance of metamorphic methane – it is more common than generally considered – and identifies a series of fundamental open questions on the topic that still need to be addressed by future work.

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