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Hydrothermal alteration in the outer solar system – constraints from Mn/Cr ages.

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Hydrothermal parent body alteration is a key process in the early solar system that significantly affects the further evolution and transport of highly volatile elements throughout the solar system.

Here, we use Mn/Cr ages of carbonates (similar to [1]) to determine whether hydrothermal alteration occurred as a roughly simultaneously event or whether it was a sequence of different events among parent bodies in the outer solar system.

The results show that all carbonates in the studied volatile-rich clasts [2] and chondrites were formed 2-6 Ma after CAI formation suggesting that hydrothermal alteration was a near-contemporaneously event among parent bodies in the outer solar system.

Further, the timing of hydrothermal alteration corresponds with heating by ^{26}Al decay within the first ~5 Ma after CAI formation. The results are hereby consistent with a model in which the carbonates in low-temperature hydrothermally altered parent bodies precipitated from the fluids produced by melting of ice. [1] Fujiya et al. (2013) EPSL 362, 130-142. [2] Patzek et al. (2018) MAPS 53, 2519–2540.

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