

Formation of Outflow Channels on Mars: Testing the Origin of Reull Vallis in Hesperia Planum by Large-scale Lava-Ice Interactions and Top-down Melting

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PII: S0019-1035(17)30558-4  
DOI: [10.1016/j.icarus.2018.01.001](https://doi.org/10.1016/j.icarus.2018.01.001)  
Reference: YICAR 12767

To appear in: *Icarus*

Received date: 1 August 2017  
Revised date: 16 November 2017  
Accepted date: 1 January 2018

Please cite this article as: James P. Cassanelli , James W. Head , Formation of Outflow Channels on Mars: Testing the Origin of Reull Vallis in Hesperia Planum by Large-scale Lava-Ice Interactions and Top-down Melting, *Icarus* (2018), doi: [10.1016/j.icarus.2018.01.001](https://doi.org/10.1016/j.icarus.2018.01.001)



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**Highlights.**

- Ice sheet existence coincident with Late Noachian-Early Hesperian volcanism.
- Formation of Reull Vallis by ice sheet lava heating and loading is explored.
- Heating/loading causes significant melting, runoff, & deformation.
- Tested origin model offers advantages over previous formation models.
- Morphologic constraints are generally satisfied, though some uncertainties remain.

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