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SUPPLEMENTARY INFORMATION

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# Formation of diamonds in laser-compressed hydrocarbons at planetary interior conditions

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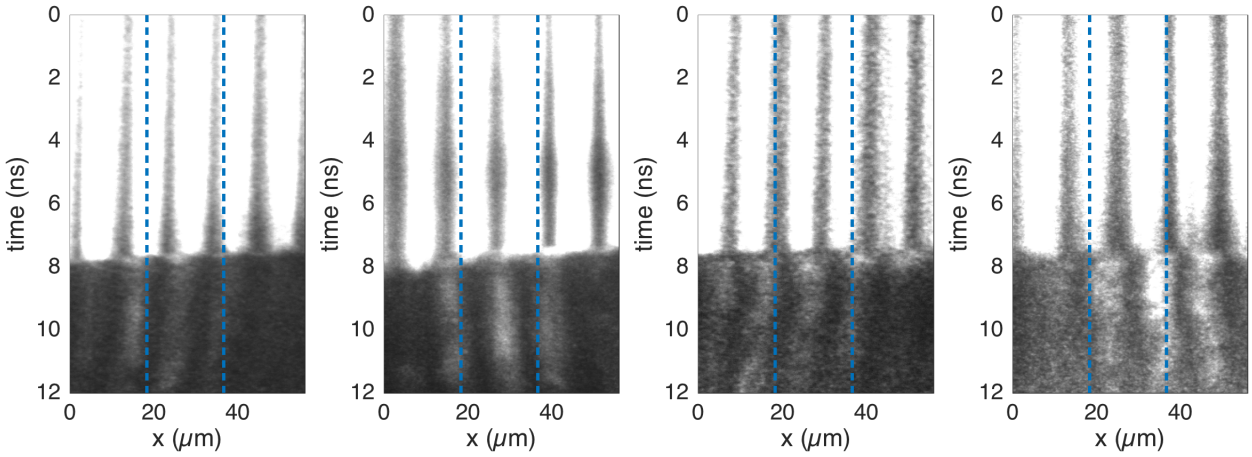
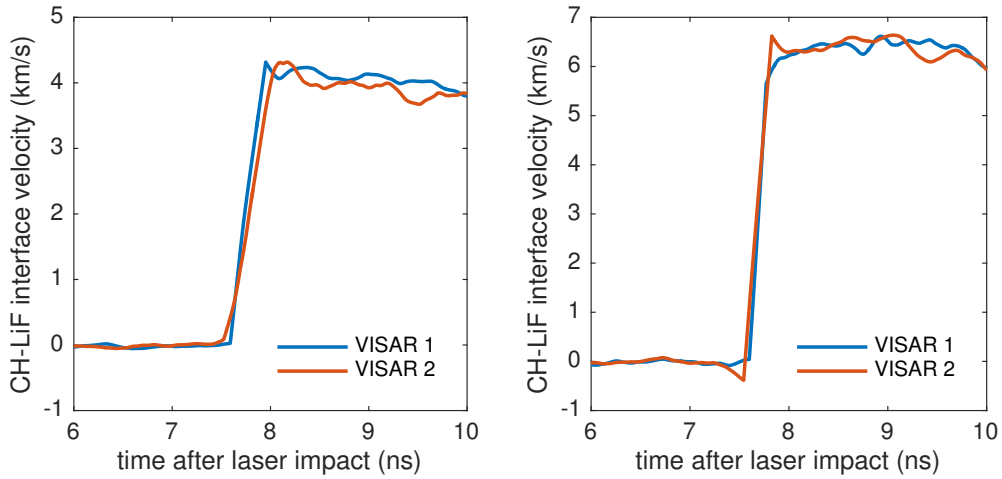
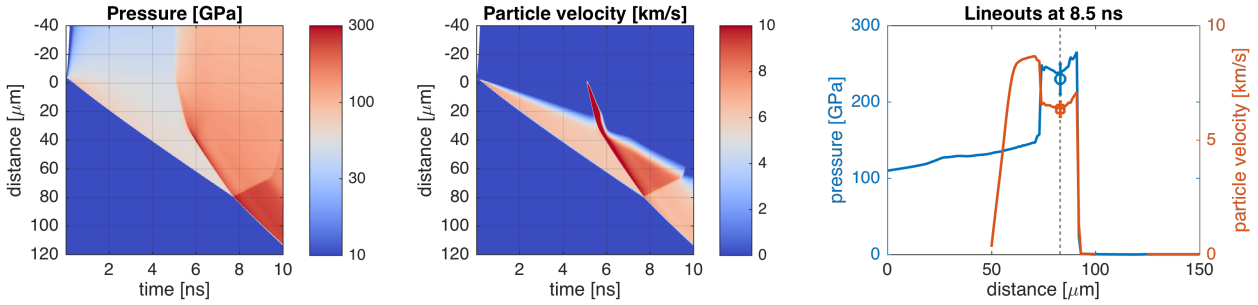


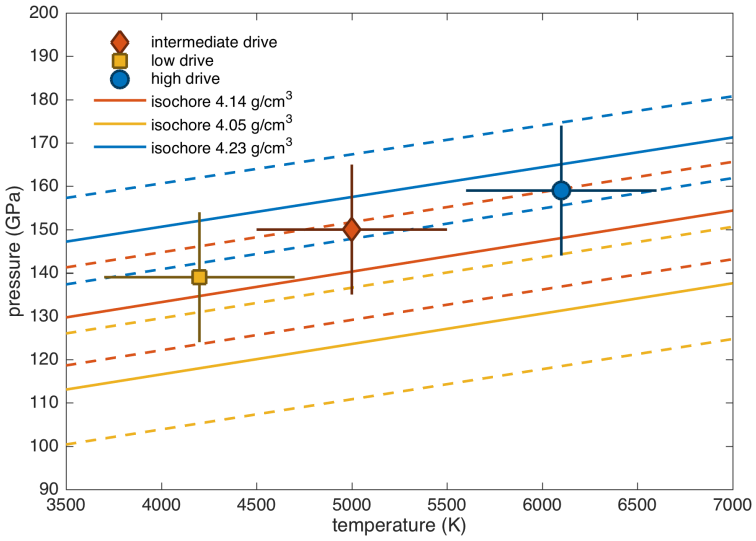

**Supplementary Figure** 1. **Typical raw data of VISAR data from CH targets with attached LiF window for the applied single-shock and the timed double-shock compression that is used for the "intermediate-pressure drive" condition.** The single-shock corresponds to the first compression step in the double-shock. From left to right: single-shock VISAR 1, single-shock VISAR 2, double-shock VISAR 1, double-shock VISAR 2. The blue dashed lines illustrate the spatial region that is probed in the X-ray experiments. The velocity per fringe (VPF) is 4.81 km/s for VISAR 1 and 7.66 km/s for VISAR 2.




**Supplementary Figure** 2. **Velocities that have been extracted from the VISAR images in Supplementary Figure 1.** Left: single shock data, right: double-shock data.




**Supplementary Figure** 3. **Simulation of the double-shock drive with an attached LiF window for the "intermediate-drive" condition: pressure, particle velocity and a line-out illustrating both at 8.5 ns.** Negative particle velocities, as present in the ablation plasma, are not shown. The gray dashed line in the right panel marks the CH-LiF interface. The measured value of interface velocity and inferred pressure (blue circle and red square) are in good agreement with the simulations.




**Supplementary Figure** 4. **Consistency check of the results of the hydrodynamic simulations with a well established multiphase equation of state for carbon (Ref. 28)**. The hydro results with appropriate error bars, that are given by the spatial and temporal gradients of the hydrodynamic simulations, are compared to various isochores resulting from the EOS model. The dashed lines account for the density uncertainties from the diamond diffraction features. For all results, there is reasonable overlap within the provided uncertainties.