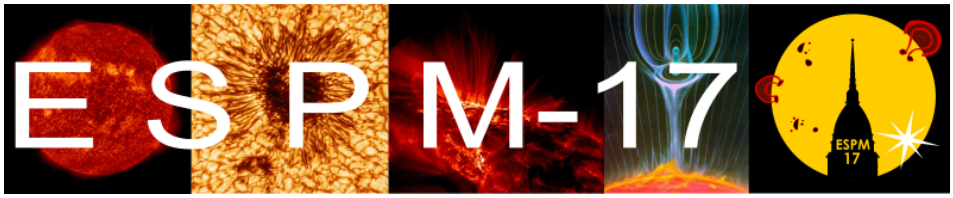

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Why "solar tsunamis" rarely leave their imprints in the chromosphere

Solar coronal waves frequently appear as bright disturbances that propagate globally from the eruption center in the solar atmosphere, just like the tsunamis in the ocean on Earth. Theoretically, coronal waves can sweep over the underlying chromosphere and leave an imprint in the form of Moreton wave, due to the enhanced pressure beneath their coronal wave front. Despite the frequent observations of coronal waves, their counterparts in the chromosphere are rarely detected. Why the chromosphere rarely bears the imprints of solar tsunamis remained a mystery since their discovery three decades ago. To resolve this question, all coronal waves and associated Moreton waves in the last decade have been initially surveyed, though the detection of Moreton waves could be hampered by utilizing the low-quality Hα data from the Global Oscillations Network Group. Here, we present eight cases (including five in the Appendix) of the coexistence of coronal and Moreton waves in inclined eruptions where it is argued that the extreme inclination is key to providing an answer to address the question. For all these events, the lowest part of the coronal wave front near the solar surface appears very bright, and the simultaneous disturbances in the solar transition region and the chromosphere predominantly occur beneath the bright segment. Therefore, evidenced by observations, we propose a scenario for the excitation mechanism of the coronal-Moreton waves in highly inclined eruptions, in which the lowest part of a coronal wave can effectively disturb the chromosphere even for a weak (e.g., B-class) solar flare.

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