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► To cite this version:

Kristel Carolina Meza Fajardo, Hideo Aochi, Apostolos Papageorgiou. Observed Surface Wave Energy in the Los Angeles Basin Induced By The July 6th, 2019 Mw 7.1 Ridgecrest Earthquake. 2020. hal-02442829

HAL Id: hal-02442829

<https://hal-brgm.archives-ouvertes.fr/hal-02442829>

Preprint submitted on 16 Jan 2020

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Observed Surface Wave Energy in the Los Angeles Basin Induced By The July 6th, 2019 M_w 7.1 Ridgecrest Earthquake

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ABSTRACT

The July 6th, 2019 M_w 7.1 Ridgecrest earthquake event originated north north-east of Los Angeles, at a distance of ~ 150 km as a result of shallow strike slip faulting in the crust of the North America plate. Using a very effective tool, referred to as the Normalized Inner Product (NIP), we detect, identify and extract surface wave energy propagating in the Los Angeles Basin induced by the abovementioned event. We identified both Love and Rayleigh waves, and assessed the spatial distribution of their amplitudes and durations. Love wave energy is propagating to the S, SW with an average azimuthal direction of 217° , while Rayleigh wave energy propagates to the W, SW with an azimuthal direction 242° .

The dominant frequency of the most energetic Love waves is < 0.15 Hz. Stations that have recorded very strong Love waves are located in the vicinity of the deepest parts of the basin and in close proximity to regions where the basin displays the greatest gradients (south of downtown LA and reasonably close to the LA airport). Low frequency Love wave energy is observed also at the south-eastern part of the basin where its depth displays much smaller gradients, but it is not as strong. The duration of Love waves increases as one moves to the deepest parts of the basin. However, the increase in the duration never exceeds 10% of the duration of the remaining energy present in the signal.

The dominant frequency of Rayleigh wave energy lies in the range 0.10 to 0.20 Hz, consistently throughout the basin. The Rayleigh waves are less energetic than Love waves and their peak amplitudes are observed more to the south. Rayleigh waves have been identified also outside the basin. The distributions of their duration is less clear as compared to those of Love waves. Nevertheless, the largest delay time is observed in the vicinity of the SW edge of the basin, and the duration does not exceed that of the remaining signal (i.e. after extraction of the Rayleigh wave energy).