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Characteristics of Sunquake Events Observed in Solar Cycle 24

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Helioseismic response to solar flares ("sunquakes") occurs due to localized force or/and momentum impacts observed during the flare impulsive phase in the lower atmosphere. Such impacts may be caused by precipitation of high-energy particles, downward shocks, or magnetic Lorentz force. Understanding the mechanism of sunquakes is a key problem of the flare energy release and transport. Our statistical analysis of M-X class flares observed by the Solar Dynamics Observatory during Solar Cycle 24 has shown that contrary to expectations, many relatively weak M-class flares produced strong sunquakes, while for some powerful X-class flares, helioseismic waves were not observed or were weak. The analysis also revealed that there were active regions characterized by the most efficient generation of sunquakes during the solar cycle. We found that the sunquake power correlates with maximal values of the X-ray flux derivative better than with the X-ray class. The sunquake data challenge the current theories of solar flares.