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Monitoring seismic velocity changes in the coastal and sinking sedimentary basin of Jakarta, Indonesia

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Jakarta exhibits among the fastest subsidence rates on Earth with up to 20 cm/year. It thus exposes over 30 million inhabitants to dramatic flooding due to the rising of ocean levels. Jakarta is also a relatively thick sedimentary basin that is known to amplify ground motions and will likely be prone to intense liquefaction during the next strong earthquake. We use a temporary deployment of broadband seismic stations between 2013 and 2014 to explore the temporal evolution of seismic velocity and seismic attenuation. We use both inter-station and single-station correlation functions in all components of the correlation tensor to map the changes at various spatial scales. We also explore the stability of our results with various methodologies to measure changes in seismic velocities (e.g., moving window cross spectrum, stretching, dynamic time warping, and wavelet cross-spectrum). These changes in velocity and attenuation yield changes in future ground motions, which we quantify using ground motion prediction equation and pseudo-analytical wave modeling. Finally, we correlate our results with remote sensing observation of land subsidence.