Differential Coherence Change Detection (DCCD): A new method for detecting surface changes in space and time using space-borne SAR measurements

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We present a new method, "Differential Coherence Change Detection" (DCCD) for analysis of surface changes in space and time. The method is based on comparing synthetic aperture radar (SAR) coherence maps of different time intervals. Coherence is a measure of the stability of the pixel return signal between two image acquisition times and is given in the range of 0 (no coherence, sub-pixel scatterers changed significantly) to 1 (perfect coherence, no change in sub-pixel scatterers). The coherence is governed mainly by the spatial and temporal baselines between the satellites at the two acquisitions and by sub-pixel changes during the time interval spanned by the images. Larger baselines and/or longer time intervals will lead to lower coherence. A drastic change (landslide, earthquake rupture, etc.) will decrease the coherence regardless of the time interval. Assuming that the natural changes (e.g. vegetation growth, erosion) in a specific pixel have a relatively constant rate of coherence loss with time, subtraction of two coherence maps spanning a comparable time interval will enhance all the sub-pixel changes that occurred only in one of the two time intervals.

Two applications of DCCD will be shown: (1) Sinkhole detection along the Dead Sea shores (Israel). Regions and periods of sinkhole formation are discriminated from those with less or no sinkhole formation using a series of differential coherence maps. (2) Detection of surface ruptures associated with the 2009 Harrat Lunayyir (Saudi Arabia) earthquake swarm and magma-driven rifting episode. Here, we introduce a new mapping tool for fault traces and open fissures that does not require field surveys or expensive airborne mapping missions.

שיטה חדשה לזיהוי שינויים בפני השטח בזמן ובמרחב באמצעות השוואת השינויים בעקביות של אותות רדאר מלוויינים

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אנו מציגים שיטה חדשה לזיהוי תקופות ואזורים בהם מתרחשים שינויים בפני השטח, המבוססת על השוואה של מפות עקביות (קוהרנטיות) של הדמאות רדאר מלוויינים. יוצגו דוגמאות לזיהוי של בולענים מאזור ים המלח ותופעות של קריעת פני השטח בזמן סדרת רעידות האדמה וחדירת הדייק שאירעו במערב סעודיה בשנת 2009.