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EDUCATION

2011/09 - 2018/08	Ph.D.	Graduate Institute of Applied Geology, National Central University, Taiwan
2007/09 - 2009/08	M.S.	Nature Science, Taipei Municipal University of Education, Taiwan
2000/09 - 2004/08	B.A.	Department of Nature Science Education, Taipei Municipal Teacher's College, Taiwan

EMPLOYMENT

2021/01 - present	Postdoctoral Researcher	RCEC, Academia Sinica, Taiwan
2018/09 - 2020/12	Postdoctoral Researcher	Department of Geography, National Taiwan University, Taiwan
2017/09 - 2018/07	Visiting Researcher	ISSIA, National Research Council (CNR), Italy
2009/12 - 2011/03	Research Assistant	Center for Space and Remote Sensing Research, National Central University, Taiwan

RESEARCH INTEREST

My research career focuses on monitoring the surface deformation, migration, and variation in the different spatiotemporal scale with geodetic and remote sensing data. In the recent research results, the fusion data of geodetic data, such as InSAR, GPS, and precise leveling is successful to improve the spatiotemporal resolution for monitoring the migration of land subsidence area. In addition, the multiple radar images are effectively to measure the 3D surface deformation of 2018 Hualien earthquake with InSAR technique. The coherence information of radar image pairs identifies the location of earthquake-induced disasters accurately in urban area. Recently, a new fusion method had developed to combine the optical and SAR images for measuring the 3D coseismic displacement during the Chi-Chi earthquake and discussed the terrain evolution with the relationship between the coseismic volumes and landslide volumes. Currently, I analyze the multi-temporal SAR images and fuse with optical images to detect the geohazard issues such as the landslide induced by heavy rainfall event and the safety of public construction, such as bridge, dam, and high building.

RESEARCH HIGHLIGHTS

Fusion of optical and radar imagery for measuring 3D coseismic surface deformation: The fusion method combining with the advantages of radar and optical images for measuring 3-D coseismic deformation, which suffered the limitations of huge displacement gradient, low coherence, and large temporal interval. We use the hanging wall deformation of the 1999 Chi-Chi earthquake as an example and generate 3-D coseismic displacements from the fusion method. The results provide a detailed information of displacement distribution in the hanging wall of the Chelungpu fault (CLPF) during the Chi-Chi earthquake. Along the fault, the vertical displacement increases from south to north gradually and the vertical pattern follows the topography. The area where uplift starts to be higher than the average of vertical displacements is consistent with the turning point of CLPF.

Coupled solid-fluid interaction mechanism of land subsidence: The land subsidence induced by groundwater withdrawal reflects the mechanism between the solid and fluid interaction. The reliable hydraulic parameters would improve the groundwater model and the prediction of land subsidence. Therefore, it is necessary that the observation data on the surface and under the ground need to be integrated for analysis the behaviors of coupled solid-fluid interaction. On the surface, to fuse the different geodetic data, such as leveling, GNSS, and InSAR with geostatistics method for increase the spatiotemporal resolution of observation data and its application range. Under the ground, to integrate the geohydrology data, groundwater leveling, and compaction monitoring well for inversion the hydraulic parameters in the local area. Finally, to analyze the relationship between the observation data on the surface and under the ground for detecting the spatiotemporal distribution variation of land subsidence and corresponding the local history of Industrial development in the Choushui river fluvial plain.

Identification of earthquake-induced disasters in urban area with coherence difference analysis: The coherence difference between two image pairs is useful information to detect specific disasters in a regional-scale area after an earthquake event. To remove background effects such as the atmospheric effect and ordinal surface changes, we employ the two-step threshold method to develop the coseismic coherence difference (CCD) map for our analyses. The CCD results can accurately identify earthquake-induced land subsidence and surface displacements, even for areas with insufficient geological data or for areas that had been excluded from the liquefaction potential map. In addition, the CCD details the distribution of building damages and structure failures, which might be useful information for emergency actions applied to regional-scale problems.

REPRESENTATIVE PUBLICATIONS (*: corresponding author)

1. Chuang, R.Y.*, **Lu, C.H.**, Yang, C.J., Lin, Y.S., and Lee T.Y., 2020, Coseismic uplift of the 1999 *M* w7.6 Chi-Chi earthquake and implication to topographic change in frontal mountain belts. *Geophysical Research Letters*, 47(15), e2020GL088947. DOI: 10.1029/2020GL088947. (SCI).
2. **Lu, C.H.**, Lin, Y.S., and Chuang, R.Y.*, 2020, Pixel offset fusion of SAR and optical images for 3D coseismic surface deformation. *IEEE Geoscience and Remote Sensing Letters*. Early Access. DOI: 10.1109/LGRS.2020.2991758. (SCI)
3. Kuo, Y.T., Wang, Y.*, Hollingsworth, J., Huang, S.Y., Chuang, R.Y., **Lu, C.H.**, Hsu, Y.C., Tung, H., Yen J.Y., and Chang C.P., 2019, Shallow Fault Rupture of the Milun Fault in the 2018 Mw 6.4 Hualien Earthquake: A High- Resolution Approach from Optical Correlation of Pléiades Satellite Imagery. Seismological Research Letters, 90(1), 97-107. DOI: 10.1785/0220180227. (SCI)
4. Yen, J.Y.*, **Lu, C.H.**, Dorsey, R.J., Kuo-Chen H., Chang, C.P., Wang, C.C., Chuang, R.Y., Kuo, Y.T., Chiu, C.Y., Chang, Y.H., Bovenga, F., and Chang, W.Y., 2019, Insights into Seismogenic Deformation during the 2018 Hualien, Taiwan, Earthquake Sequence from InSAR, GPS, and Modeling. Seismological Research Letters, 90(1), 78-87. DOI:10.1785/0220180228. (SCI)
5. **Lu, C.H.***, Bovenga, F., Yen J.Y., and Chang C.P., 2018, Analysis of the 2018 Hualien earthquake (Taiwan) by using SAR interferometry and pixel offset techniques. Proceeding SPIE 10788, Active and Passive Microwave Remote Sensing for Environmental Monitoring II, 107880K (9 October 2018). DOI: 10.1117/12.2325838.
6. **Lu, C.H.**, Ni, C.F.*, Chang, C.P., Yen, J.Y., and Chuang, R.Y., 2018, Coherence difference analysis of Sentinel-1 SAR interferogram to identify earthquake-induced disasters in urban areas. Remote Sensing, 10(8), 1318. DOI: 10.3390/rs10081318. (SCI)
7. **Lu, C.H.**, Ni, C.F.*, Chang, C.P., Chen, Y.A., and Yen, J.Y., 2016, Geostatistical data fusion of multiple type observations to improve land subsidence monitoring resolution in the Choushui River Fluvial Plain, Taiwan. Terrestrial Atmospheric and Oceanic Sciences, 27(4), 505-520. DOI: 10.3319/TAO.2016.01.29.02(ISRS). (SCI)
8. **Lu, C.H.***, Ni, C.F., Chang, C.P., Yen, J.Y., and Hung, W.C., 2015, Combination with precise leveling and PSInSAR observations to quantify pumping-induced land subsidence in central Taiwan. Proceedings of the International Association of Hydrological Sciences (Proc. IAHS), 372, 77-82. DOI:10.5194/piahs-372-77-2015.
9. **Lu, C.H.***, Ni, C.F., Chang, C.P., Yen, J.Y., and Hung, W.C., 2015, Integrations of multiple observations to estimate hydraulic parameters in Choushui River Fluvial Plain of central Taiwan. Engineering Geology for Society and Territory- Volume 5, no.186, 967-971. DOI:

10.1007/978-3-319-09048-1_186.

10. Wu Y.Y., Hu, J.C.*, Lin, G.P., Chang, C.P., Tung, H., and **Lu, C.H.**, 2013, Transient active deformation in Tainan tableland using persistent scatterers SAR interferometry. Bulletin de la Société Géologique de France, v. 184, no. 4-5, p. 441-450. (SCI)
11. Yen, J.Y.*, **Lu, C.H.**, Chang, C.P., Hooper, A., Chang, Y.H., Liang, W.T., Chang, T.Y., Lin, M.S., and Chen, K.S., 2011, Investigating the active deformation in the northern longitudinal valley and hualien city of eastern taiwan by using persistent scatterer and small-baseline sar interferometry. Terrestrial Atmospheric and Oceanic Sciences, 22(3), 291-304. (SCI)

Others (Invited Talks，Keynote speech et al.)