

Earth System Science Programme  
 Faculty of Science  
 The Chinese University of Hong Kong  
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### Education

|   |      |
|---|------|
| Ph.D. in Geophysics, University of Colorado at Boulder, USA | 2011 |
| B.Sc. in Geophysics, Wuhan University, China                | 2005 |

### Research Interests

- Cryosphere Geophysics
- Near Surface Geophysics
- Interactions of the solid earth with atmosphere, ocean, and cryosphere
- Geodesy
- Remote Sensing

### Honors and Awards (since graduate school)

|  |           |
|--|-----------|
| Exemplary Teaching Award, Faculty of Science, CUHK                   | 2016      |
| George Thompson Postdoctoral Fellowship, Stanford University         | 2011–2013 |
| NASA Earth and Space Science Fellowship                              | 2008–2011 |
| CIRES Graduate Research Assistant Fellowship, University of Colorado | 2006–2007 |

### Professional Experience

|   |              |
|---|--------------|
| The Chinese University of Hong Kong (CUHK)                              | 2014–present |
| Assistant Professor, Earth System Science Programme, Faculty of Science |              |
| Research Fellow, Institute of Environment, Energy and Sustainability    |              |
| Research Fellow, Institute of Space and Earth Information Science       |              |
| Visiting Scholar, Stanford University                                   | 2014–present |
| George Thompson Postdoctoral Fellow, Stanford University                | 2011–2013    |
| Research Assistant, University of Colorado                              | 2006–2011    |

### Teaching Experience

|   |                       |
|---|-----------------------|
| Exploring the Earth System (ESSC1000), CUHK   | Fall 2016–2018        |
| Solid Earth Dynamics (ESSC2010), CUHK   | Spring 2014–2018      |
| Applied Geophysics (ESSC4110 & EASC5110), CUHK  | Fall 2017             |
| Engineering Geology and Applied Geophysics (ESSC4110, co-taught with T.F. Wong), CUHK | Spring 2016           |
| Remote Sensing: Principles and Applications (ESSC4540), CUHK                          | Fall 2014, 2016, 2018 |
| Research Frontiers in Earth and Atmospheric Sciences (EASC5001/5002), CUHK            | 2014–2018             |
| Hydrogeology (ESSC3220, co-taught with T.F. Wong), CUHK                               | Fall 2014             |
| Undergraduate Research Mentor, Stanford University                                    | 2012–2013             |
| Teaching Assistant, Experimental Physics, University of Colorado                      | 2005–2006             |
| Teaching Assistant, Electricity and Magnetism, University of Colorado                 | 2005–2006             |

## Publications

1. Chen, X. **L. Liu**, A. Bartsch (2019), Detecting soil freeze/thaw onsets in Alaska using SMAP and ASCAT data, *Remote Sensing of Environment*, 220, 59–70, doi:10.1016/j.rse.2018.10.010.
2. **Liu, L.** and K. M. Larson (2018), Decadal changes of surface elevation over permafrost area estimated using reflected GPS signals, *The Cryosphere*, 12, 477–489, doi:10.5194/tc-12-477-2018.
3. Hu, Y., **L. Liu**, K. M. Larson, K. M. Schaefer, J. Zhang, and Y. Yao (2018), GPS Interferometric Reflectometry reveals cyclic elevation changes in thaw and freezing seasons in a permafrost area (Barrow, Alaska), *Geophysical Research Letters*, 45, 5581–5589, doi:10.1029/2018GL077960.
4. Zhang, B., E. Zhang, **L. Liu**, S. A. Khan, T. van Dam, Y. Yao, M. Bevis, V. Helm (2018), Geodetic measurements characterize the short-term changes of glacial mass near Jakobshavn Isbræ (Greenland) from 2007 to 2017, *Earth and Planetary Science Letters*, 503, 216–226, doi:10.1016/j.epsl.2018.09.029.
5. Chen, J., **L. Liu**, T. Zhang, B. Cao, H. Lin (2018), Using Persistent Scatterer Interferometry to map and quantify permafrost thaw subsidence: a case study of Eboling Mountain on the Qinghai-Tibet Plateau, *Journal of Geophysical Research: Earth Surface*, 123, doi:10.1029/2018JF004618.
6. Ran, J., Vizcaino, M., Ditmar, P., van den Broeke, M. R., Moon, T., Steger, C. R., Enderlin, E. M., Wouters, B., Noël, B., Reijmer, C. H., Klees, R., Zhong, M., **L. Liu**, and Fettweis, X. (2018) Seasonal variations show timing and magnitude of meltwater storage in the Greenland ice sheet, *The Cryosphere*, 12, 2981–2999, doi:10.5194/tc-12-2981-2018.
7. Chen, J., Günther, F., Grosse, G., **Liu, L.**, and Lin, H. (2018), Sentinel-1 InSAR measurements of surface elevation changes over yedoma uplands on Sobo-Sise Island, Lena Delta, *Remote Sensing*, 10(7), 1152, doi:10.3390/rs10071152.
8. Schuster, P. F., K. M. Schaefer, G. R. Aiken, R. C. Antweiler, J. F. Dewild, J. D. Gryziec, A. Gusmeroli, G. Hugelius, E. Jafarov, D. P. Krabbenhoft, **L. Liu**, N. Herman-Mercer, C. Mu, D. A. Roth, T. Schaefer, R. G. Striegl, K. P. Wickland, and T. Zhang (2018), Permafrost stores a globally significant amount of mercury, *Geophysical Research Letters*, 45, 1463–1471, doi:10.1002/2017GL075571.
9. Wu, Z., L. Zhao, **L. Liu**, L. Tian, R. Zhu, H. Zhou, Z. Gao (2018), Surface deformation monitoring in the permafrost regions over Tibetan Plateau using Sentinel-1 data, *Sciences in Cold and Arid Regions*, 10(2), 114–125, doi:10.3724/SP.J.1226.2018.00114.
10. Jafarov E., A. D. Parsekian, K. Schaefer, **L. Liu**, A. Chen, S. Panda, T. Zhang (2018), Estimating active layer thickness and volumetric water content from ground penetrating radar measurements in Barrow, Alaska, *Geoscience Data Journal*, 4, 72–79, doi:10.1002/gdj3.49.
11. Zhang, B. **L. Liu**, S. A. Khan, T. van Dam, E. Zhang, and Y. Yao (2017), Transient variations in glacial mass near Upernavik Isstrøm (west Greenland) detected by the combined use of GPS and GRACE data, *Journal of Geophysical Research: Solid Earth*, 122, 10,626–10,642, doi:10.1002/2017JB014529.
12. **Liu, L.**, S. A. Khan, T. van Dam, J. H. Y. Ma, and M. Bevis (2017), Annual variations in GPS-measured vertical displacements near Upernavik Isstrøm (Greenland) and contributions from surface mass loading, *Journal of Geophysical Research: Solid Earth*, 122, 677–691, doi:10.1002/2016JB013494.
13. Wang, X., **L. Liu**, L. Zhao, T. Wu, Z. Li, and G. Liu (2017), Mapping and inventorying active rock glaciers in the northern Tien Shan of China using satellite SAR interferometry, *The Cryosphere*, 11, 997–1014, doi:10.5194/tc-11-997-2017.
14. Iwahana G., M. Uchida, **L. Liu**, W. Gong, F. Meyer, R. Guritz, T. Yamanoguchi, and L. Hinzman (2016), Field evidence and InSAR detection of thermokarst after a tundra wildfire, using ALOS-PALSAR, *Remote Sensing*, 8(3), 218, doi:10.3390/rs8030218.
15. Chen, A., A. Parsekian, K. Schaefer, E. Jafarov, S. Panda, **L. Liu**, T. Zhang, and H. Zebker (2016), Ground-penetrating radar-derived measurements of active-layer thickness on the landscape scale with sparse calibration at Toolik and Happy Valley, Alaska, *Geophysics*, 81(2), H1-H11, doi:10.1190/geo2015-0124.1.

16. **Liu, L.**, Schaefer, K., Chen, A., Gusmeroli, A., Zebker, H. A., and Zhang, T. (2015), Remote sensing measurements of thermokarst subsidence Using InSAR, *Journal of Geophysical Research: Earth Surface*, 120, 1935–1948, doi:10.1002/2015JF003599.
17. Jones, B. M., G. Grosse, C. D. Arp, E. Miller, **L. Liu**, D. J. Hayes, and C. F. Larsen (2015), Recent Arctic tundra fire initiates widespread thermokarst development, *Scientific Reports*, 5:15865, doi:10.1038/srep15865.
18. Schaefer, K., **L. Liu**, A. Parsekian, E. Jafarov, A. Chen, T. Zhang, A. Gusmeroli, H. A. Zebker, and T. Schaefer (2015), Remotely Sensed Active Layer Thickness (ReSALT) at Barrow, Alaska using Interferometric Synthetic Aperture Radar, *Remote Sensing*, 7, 3735–3759, doi:10.3390/rs70403735.
19. Gusmeroli, A., **L. Liu**, T. Zhang, K. Schaefer, T. Schaefer, and G. Grosse (2015), Active layer stratigraphy and organic layer thickness at a thermokarst site in Arctic Alaska identified using Ground Penetrating Radar, *Arctic Antarctic and Alpine Research*, 47(2), 195–202, doi:10.1657/AAAR00C-13-301.
20. **Liu, L.**, E. Jafarov, K. Schaefer, B. M. Jones, H. Zebker, C. Williams, J. Rogan, and T. Zhang (2014), InSAR detects increase in surface subsidence caused by an Arctic tundra fire, *Geophysical Research Letters*, 41, 3906–3913, doi:10.1002/2014GL060533.
21. **Liu, L.**, Schaefer, K., Gusmeroli, A., Grosse, G., Jones, B. M., Zhang, T., Parsekian, A. D., and Zebker, H. A. (2014), Seasonal thaw settlement at drained thermokarst lake basins, Arctic Alaska, *The Cryosphere*, 8, 815–826, doi:10.5194/tc-8-815-2014.
22. Khan, S. A., K. H. Kjær, M. Bevis, J. L. Bamber, J. Wahr, K. K. Kjeldsen, A. A. Bjørk, N.J. Korsgaard, L. A. Stearns, M. R. Broeke, **L. Liu**, N. K. Larsen, I. S. Muresan (2014), Sustained mass loss of the Northeast Greenland ice sheet triggered by regional warming, *Nature Climate Change*, 4, 292–299, doi:10.1038/nclimate2161.
23. Mu, C., T. Zhang, P. F. Schuster, K. Schaefer, K. P. Wickland, D. A. Repert, **L. Liu**, and G. Cheng (2014), Carbon and geochemical properties of cryosols on the North Slope of Alaska, *Cold Regions Science and Technology*, 100, 59–67, doi:10.1016/j.coldregions.2014.01.001.
24. **Liu, L.**, C. Millar, R. Westfall, and H. Zebker (2013), Surface motion of active rock glaciers in the Sierra Nevada, California, USA: inventory and a case study using InSAR, *The Cryosphere*, 7, 1109–1119, doi:10.5194/tc-7-1109-2013.
25. Parsekian, A., G. Grosse, J. Walbrecker, M. Muller-Petke, K. Keating, **L. Liu**, B. Jones, and R. Knight (2013), Detecting unfrozen sediments below thermokarst lakes with Surface Nuclear Magnetic Resonance, *Geophysical Research Letters*, 40, 1–6, doi:10.1002/grl.50137.
26. Wahr, J., S. A. Khan, T. Van Dam, **L. Liu**, J. H. van Angelen, M. R. van den Broeke, and C. M. Meertens (2013), The use of GPS horizontals for loading studies, with applications to northern California and south-east Greenland, *Journal of Geophysical Research: Solid Earth*, 118, 1795–1806, doi:10.1002/jgrb.50104.
27. Nielsen, K., S. A. Khan, G. Spada, J. Wahr, M. Bevis, **L. Liu**, and T. Van Dam (2013), Vertical and horizontal surface displacements near Jakobshavn Isbræ driven by melt-induced and dynamic ice loss, *Journal of Geophysical Research: Solid Earth*, 118, 1837–1844, doi:10.1002/jgrb.50145.
28. **Liu, L.**, J. Wahr, I. Howat, S. A. Khan, I. Joughin, and M. Furuya (2012), Constraining ice mass loss from Jakobshavn Isbræ (Greenland) using InSAR-measured crustal uplift, *Geophysical Journal International*, 188: 994–1006, doi:10.1111/j.1365-246X.2011.05317.x.
29. **Liu, L.**, K. Schaefer, T. Zhang, and J. Wahr (2012), Estimating 1992–2000 average active layer thickness on the Alaskan North Slope from remotely sensed surface subsidence, *Journal of Geophysical Research: Earth Surface*, 117, F01005.
30. **Liu, L.**, T. Zhang, and J. Wahr (2010), InSAR measurements of surface deformation over permafrost on the North Slope of Alaska, *Journal of Geophysical Research: Earth Surface*, 115, F03023.
31. Khan, S. A., **L. Liu**, J. Wahr, I. Howat, I. Joughin, T. Van Dam, and K. Fleming (2010), GPS measurements of crustal uplift near Jakobshavn Isbræ due to glacial ice mass loss. *Journal of Geophysical Research: Solid Earth*, 115, B09405, doi:10.1029/2010JB007490.

32. Shen W., **L. Liu**, and J. Ning (2007), The inner core’s super rotation and its influences on the gravity field, *Chinese Journal of Geophysics* (in Chinese), 50(2), 430–436.

#### **Published Data Products:**

33. **Liu, L.**, K. M. Larson (2018), Surface elevation changes near Barrow (Alaska) measured using reflected GPS signals. PANGAEA, <https://doi.pangaea.de/10.1594/PANGAEA.885935>
34. Zhang, B., **L. Liu**, S. A. Khan, T. van Dam, E. Zhang, and Y. Yao (2017), GPS and GRACE inferred uplifts and extracted transient and seasonal signals due to glacial mass change near Upernavik Isstrøm, PANGAEA, <https://doi.org/10.1594/PANGAEA.880159>
35. Wang, X., **L. Liu**, L. Zhao, T. Wu, Z. Li, and G. Liu (2017), An inventory of active rock glaciers in the northern Tien Shan of China compiled using satellite SAR interferometry, PANGAEA, <https://doi.pangaea.de/10.1594/PANGAEA.874616>
36. Jafarov, E., A. Parsekian, K. Schaefer, **L. Liu**, A. Chen, S.K. Panda, and T. Zhang (2016), Pre-ABoVE: Active Layer Thickness and Soil Water Content, Barrow, Alaska, 2013. ORNL DAAC, Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORNLDAAAC/1355>
37. Chen, A., A. Parsekian, K. Schaefer, E. Jafarov, S.K. Panda, **L. Liu**, T. Zhang, and H.A. Zebker. 2015. Pre-ABoVE: Ground-penetrating Radar Measurements of ALT on the Alaska North Slope. Data set. Available on-line [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORNLDAAAC/1265>
38. **Liu, L.**, K. Schaefer, A. Chen, A. Gusmeroli, E. Jafarov, S. Panda, A. Parsekian, T. Schaefer, H. A. Zebker, T. Zhang. 2015. Pre-ABoVE: Remotely Sensed Active Layer Thickness, Barrow, Alaska, 2006-2011. Data set. Available on-line [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORNLDAAAC/1266>
39. **Liu, L.**, K. Schaefer, A. Chen, A. Gusmeroli, E. Jafarov, S. Panda, A. Parsekian, T. Schaefer, H. A. Zebker, T. Zhang. 2015. Pre-ABoVE: Remotely Sensed Active Layer Thickness, Prudhoe Bay, Alaska, 1992-2000. Data set. Available on-line [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORNLDAAAC/1267>

#### **Other Publications (non-peer reviewed):**

40. Panda S., K. Schaefer, **L. Liu**, E. Jafarov, A. Parsekian, A. Chen, Connecting lake area change, ground subsidence and permafrost carbon dynamics in Prudhoe Bay, Changing Ice: A Newsletter of Cryosphere Research in Alaska, December 2015.
41. **Liu, L.** (2015) Melting Glaciers in High Asia and their Impacts on Water Sustainability, CUHK Sustainable Campus, No 10, October 2015.
42. Contributing author to Bartsch et al. (2014) Requirements for Monitoring of Permafrost in Polar Regions: A community white paper in response to the WMO Polar Space Task Group.
43. **Liu, L.**, C. Millar, R. Westfall, and H. Zebker (2013), Taking a Census of California Rock Glaciers from Space, Mountain Views, Volume 7, No 2, November 2013.
44. **Liu, L.**, (2011), Studying changes in the cryosphere using radar interferometry: permafrost surface subsidence and glacial unloading deformation, *PhD thesis*, University of Colorado.
45. **Liu, L.**, T. Zhang, K. Schaefer, and J. Wahr, InSAR Observations Revealed Surface Subsidence Over Permafrost in Northern Alaska, Alaska Satellite Facility News and Notes, 2011 Spring Volume.

#### **Papers in review:**

46. Zhou, Z. **L. Liu**, L. Jiang, W. Feng, S. V. Samsonov, Using long-term SAR backscatter data to monitor post-fire vegetation recovery in tundra environment, submitted to *Remote Sensing of Environment*.
47. R. J. Michaelides, H. A. Zebker, K. Schaefer, A. Parsekian, **L. Liu**, J. Chen, S. Natali, S. Ludwig, and S. Schaefer, Inference of the Impact of Wildfire on Active Layer Thickness in a Discontinuous Per-

mafrost region using the Remotely Sensed Active Layer Thickness (ReSALT) Algorithm, submitted to *Environmental Research Letters*.

48. Wang, S., W. Xu, C. Xu, Z. Yin, R. Burgmann, **L. Liu**, and G. Jiang, Changes in groundwater level encourage shallow earthquakes in central Australia: The 2016 Petermann Ranges earthquake, submitted to *Geophysical Research Letters*.

### Active Research Projects

1. GNSS-RECIPE: Global Navigation Satellite System Reflectometry Studies of Elevation Changes in Permafrost Areas (PI, Hong Kong Research Grants Council General Research Grant) 2019–present
2. Kinematics and dynamics of active rock glaciers in western China (PI, Hong Kong Research Grants Council General Research Grant) 2018–present
3. Earth observation to investigate the characteristics and changes of the cryosphere in High Mountain Asia (Co-I, NRSCC/ESA Dragon 4 Programme) 2016–present
4. Investigation of characteristics and mechanism of earthquakes associated with the Hutubi gas reservoir (Co-I, Hong Kong Research Grants Council NSFC/RGC Joint Research Scheme) 2016–present
5. Radar remote sensing investigations on thermokarst dynamics on the Qinghai-Tibet Plateau, China (PI, Hong Kong Research Grants Council General Research Grant) 2016–present

### Completed Research Projects

1. Mass Balance of Greenland Outlet Glaciers: Non-secular Variations From Space Geodetic Measurements (PI, Hong Kong Research Grants Council Early Career Scheme Grant) 2015–2018
2. The combined use of L- and P-band radar to retrieve active layer thickness over Arctic permafrost (PI, CUHK Direct Grant for Research) 2017–2018
3. Synergistic investigations of surface deformation in permafrost areas using field and remote sensing observations (Co-PI, Hong Kong Research Grants Council Germany/Hong Kong Joint Research Scheme) 2016–2017
4. Radar Remote Sensing and Field Investigation of Permafrost Changes in Svalbard (PI, CUHK Direct Grant for Research) 2014–2015
5. Remotely-Sensed Active Layer Thickness (ReSALT) product derived from InSAR data over North American Arctic regions (Co-I, NASA Terrestrial Ecology Program) 2013–2016
6. Collaborative Research: Exploring the Dynamics of the Active Layer and Near-surface Permafrost across the North Slope of Alaska (Co-I, NSF Arctic Natural Science Program) 2012–2015

### Field Experience

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|---|-----------------|
| Field study of alpine permafrost on the Qinghai-Tibet Plateau                       | 2014–2018       |
| Field study of permafrost and rock glaciers in northern Norway and Svalbard         | 2015            |
| Field geophysical study of active layer and permafrost on the North Slope of Alaska | 2009, 2012–2014 |
| Surface Nuclear Magnetic Resonance study of thermokarst lakes in Fairbanks, Alaska  | 2012            |
| Field study of structural geology in Canyonlands and Arches National Parks, Utah    | 2005            |

### University, College, and Department Services

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| Member, Search committee of assistant and associate professors, Earth System Science, CUHK | 2018         |
| Member, Review panel of Master of Science in GeoInformation Science, CUHK                  | 2017         |
| Institutional representative for CUHK, UNAVCO and WInSAR                                   | 2015–present |
| Member, Search committee of lecturer, Earth System Science, CUHK                           | 2015         |

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| Department coordinator, Chung Chi College, CUHK                                       | 2015-present |
| Member, Undergraduate committee, Earth System Science Programme, CUHK                 | 2014-present |
| Member, Graduate committee, Graduate Division of Earth and Atmospheric Sciences, CUHK | 2014-present |
| Library committee, Earth System Science Programme, CUHK                               | 2014         |

### Professional Services

Reviewer for *Journal of Geophysical Research*, *Geophysical Research Letters*, *Remote Sensing of Environment*, *Remote Sensing*, *IEEE Transactions on Geoscience and Remote Sensing*, *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, *The Cryosphere*, *Soil Science Society of America Journal*, *Earth Surface Processes and Landforms*, *International Journal of Geographical Information Science*, *Scientific Reports*, *IPCC's Special Report on Ocean and Cryosphere in a Changing Climate*, US National Science Foundation, Netherlands Space Office, Hong Kong Research Grants Council

Scientific Committee Member

- 5th International Workshop on Rock Physics 2019
- The 2nd international conference of Digital Belt and Road (DBAR 2017) & The 3rd international conference on remote sensing applications in tropical and subtropical areas (RSATSA 2017) 2017
- The 3rd International Conference on Sensors and Models in Photogrammetry and Remote Sensing 2015
- The 8th World Chinese Geosciences Congress 2015

Team member

- International Permafrost Association Action Group on Permafrost Subsidence 2018
- International Permafrost Association Action Group on Rock Glacier Inventories and Kinematics 2018
- Vulnerability of Permafrost Carbon Research Coordination Network 2012-present

Session convener and co-chair for international meetings

- Recent Advances in SAR Technology for Earth Observation AGU Meeting 2016
- Scientific Exploration of the Earth with Multi-modal Remote Sensing: InSAR and the New Sentinel-3 Mission AGU Meeting 2015
- Advances in InSAR Data Processing for Earth System Applications AGU Meeting 2014
- Advances in Geophysical Characterization of Permafrost Systems AGU Meeting 2013

Judge for the Outstanding Student Paper Awards, AGU Fall Meetings 2011–2016

Member of thesis defense committee: WANG Xiaowen and DAI Keren (Southwest Jiaotong University, Faculty of Geosciences and Environmental Engineering), 2017

### Research Students Supervised

CUHK Postgraduates: Joseph H.Y. MA, Jie CHEN, Xiyu CHEN, Enze ZHANG, Lingcao HUANG, Yan HU, Jiahua ZHANG

Postdocs: Bo HU (2015), Zhiwei ZHOU (2016-17), Bao ZHANG (2017-18), Jiangjun Ran (2018-present)

CUHK Undergraduates (22+ in the past 4 years)

### Outreach Activities

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|---|-------|
| Exhibition on permafrost carbon feedbacks, Hong Kong Jockey Club Museum of Climate Change | 2017- |
| Discussion panelist, public screening of 'Ice and the sky'                                | 2015  |

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| Public talk on the Arctic | 2014-2017 |
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- Hong Kong Jockey Club Museum of Climate Change
- 13th Lau Oi Wah Memorial Science Lecture Series
- CUHK Knowledge Enrichment Programme for Secondary School Students

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|---|------|
| Interviewed with <i>Radio and Television Hong Kong</i> on global climate change | 2014 |
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| Interviewed with <i>Headline Daily</i> on Greenland and sea level change | 2014 |
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