

<D25-2> Revised version (2023.7.31)

Application Form for World Centre of Excellence on Landslide Risk Reduction **2023-2026**

1. Name of Organization

Institute of Cold Regions Science and Engineering, Northeast Forestry University

2. Name of Leader: Ying Guo

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Core members of the activities Names/Affiliations: (4 individuals maximum)

Wei Shan	Professor	Institute of Cold Regions Science and Engineering, Northeast Forestry University
Lijun Wan	Associate professor	Institute of Cold Regions Science and Engineering, Northeast Forestry University
Haipeng Wang	Associate professor	Institute of Cold Regions Science and Engineering, Northeast Forestry University
Huizhong Xiong	Associate professor	Institute of Cold Regions Science and Engineering, Northeast Forestry University

3. Date of Submission of Application

2023.04.01

4. Activity scale and targeted region.

Global.

5. Short Title characterizing past and planned activities (10 words maximum)

Monitoring analysis and numerical simulation of permafrost thawing and landslides movement process in Northeast China

6. Objectives for 3 years: (5 lines maximum; what you expect to accomplish?)

Distribution, change and cartography of landslides in permafrost areas of Northeast China.

7. Background Justification: (10 lines maximum)

The mechanism, dynamic characteristics, movement process and characteristics of landslides caused by permafrost thawing are more complicated than general landslides. By understanding the changes of the above factors, the results are of great scientific significance and practical value, the theories of landslides are enriched and the scientific and effective engineering countermeasures are formulated.

8. Resources available for WCoE activities

Relying on ICL-CRLN and other related institutions, relevant researches are conducted jointly in a targeted manner, and the results of the research will make new contributions to KLC2020.

9. Description of your past activities related to risk reduction of landslides and other related earth system disasters (30 lines maximum)

In the past 20 years, starting from the exploration of countermeasures for slope protection of soil cutting slope in seasonally frozen area, the research and exploration on the mechanism, dynamic characteristics, movement process of landslides caused by permafrost thawing was gradually deepened. The theoretical system of landslide research in cold regions was established. Through engineering practices, the theoretical analysis results and the correctness and feasibility of related engineering countermeasures are verified.

10. Planned future activities /Expected Results: (20 lines maximum; work phases and milestones)

High-resolution permafrost distribution change map and the ground deformation map will be developed in Northeast China. And after practical validation, the landslides risk map will be developed in northeast permafrost areas.

11. Beneficiaries of WCoE: (5 lines maximum; who directly benefits from the work?)

Government departments, colleges and universities, communities and project management departments of engineering construction.

12. References: 10 lines maximum, i.e., relevant publications, international/regional/national recognition supporting items 9-10.

Guo, Y.; Du Y.; Shan, W., Zhang, C. (2023). Numerical analysis of the effect of rainfall on the stability of sandstone-covered mudstone cutting slopes. ICL book series “P-LRT” (accepted in Vol. 2 Issue 2 in 2023)

Shan, W., Zhang, C., Guo, Y. (2024). Dynamic analysis of mountain landslides caused by thawing of patchy permafrost. Plan in ICL book series “P-LRT” (Vol. 3, Issue 1 to be submitted by 30 August 2023.)

Shan, W., Zhang, C., Guo, Y., Shan, M., Zeng, X., Wang, C. (2021). Climate Change and Surface Deformation Characteristics in Degradation Area of Permafrost in Lesser Khingan Mountain, China.

- In: Vilímek, V., Wang, F., Strom, A., Sassa, K., Bobrowsky, P.T., Takara, K. (eds) Understanding and Reducing Landslide Disaster Risk. WLF 2020. ICL Contribution to Landslide Disaster Risk Reduction. Springer, Cham. https://doi.org/10.1007/978-3-030-60319-9_24
- Shan, W., Guo, Y., Zhang, C., Hu, Z., Jiang, H., Wang, C. (2014). Climate-Change Impacts on Embankments and Slope Stability in Permafrost Regions of Bei'an-Heihe Highway. In: Sassa, K., Canuti, P., Yin, Y. (eds) Landslide Science for a Safer Geoenvironment. Springer, Cham. https://doi.org/10.1007/978-3-319-04999-1_18
- Guo, Y., Zhang, C., Han, Q. et al. Seminar on “Engineering and environmental geology in the permafrost region along the Sino-Russian-Mongolian Economic Corridor under the background of climate change” and the Annual Academic Conference of 2018 of ICL-CRLN and the Cold Region Landslide Research of IPL-WCoE held in Harbin. Landslides 16, 857–861 (2019). <https://doi.org/10.1007/s10346-019-01157-z>
- Guo, Y., Shan, W., Xu, Z., Wang, C., Wang, S. (2021). Identification Old Landslides in Permafrost Degradation Area in Northeast China by Difference Distribution of Surface Trees. In: Vilímek, V., Wang, F., Strom, A., Sassa, K., Bobrowsky, P.T., Takara, K. (eds) Understanding and Reducing Landslide Disaster Risk. WLF 2020. ICL Contribution to Landslide Disaster Risk Reduction. Springer, Cham. https://doi.org/10.1007/978-3-030-60319-9_30
- Jiang, H., Shan, W., Hu, Z. (2015). Freeway Extension Project Island Permafrost Section Foundation Deformation Characteristics. In: Lollino, G., Manconi, A., Clague, J., Shan, W., Chiarle, M. (eds) Engineering Geology for Society and Territory - Volume 1. Springer, Cham. https://doi.org/10.1007/978-3-319-09300-0_46
- Wang, C., Shan, W. (2018). TXT-tool 1.086-1.1 Distribution of Island-like Permafrost in the Lesser Khingan Mountains of Northeast China Using Landsat7 ETM+ Imagery. In: Sassa, K., et al. Landslide Dynamics: ISDR-ICL Landslide Interactive Teaching Tools . Springer, Cham. https://doi.org/10.1007/978-3-319-57774-6_14
- Wang, C., Shan, W., Guo, Y., Hu, Z., Jiang, H. (2014). Permafrost Distribution Study Based on Landsat ETM+ Imagery of the Northwest Section of the Lesser Khingan Range, China. In: Sassa, K., Canuti, P., Yin, Y. (eds) Landslide Science for a Safer Geoenvironment. Springer, Cham. https://doi.org/10.1007/978-3-319-04996-0_81
- Wang, C., Shan, W., Guo, Y., Hu, Z., Jiang, H. (2015). Permafrost Distribution Research Based on Remote Sensing Technology in Northwest Section of Lesser Khingan Range in China. In: Lollino, G., Manconi, A., Clague, J., Shan, W., Chiarle, M. (eds) Engineering Geology for Society and Territory - Volume 1. Springer, Cham. https://doi.org/10.1007/978-3-319-09300-0_53
- Shan, W., Hu, Z., Guo, Y. (2018). TXT-tool 4.086-1.3: The Impact of Climate Change on Landslides in Southeastern of High-Latitude Permafrost Regions of China. In: Sassa, K., Tiwari, B., Liu, KF.,

- McSaveney, M., Strom, A., Setiawan, H. (eds) *Landslide Dynamics: ISDR-ICL Landslide Interactive Teaching Tools*. Springer, Cham. https://doi.org/10.1007/978-3-319-57777-7_46
- Shan, W., Xu, Z., Guo, Y. et al. Geological methane emissions and wildfire risk in the degraded permafrost area of the Xiao Xing'an Mountains, China. *Sci Rep* 10, 21297 (2020). <https://doi.org/10.1038/s41598-020-78170-z>
- Jiang, H., Shan, W., Hu, Z., Guo, Y. (2014). Formation Mechanism and Deformation Characteristics of Cut Layer Rock Landslide in Island Permafrost Region. In: Sassa, K., Canuti, P., Yin, Y. (eds) *Landslide Science for a Safer Geoenvironment*. Springer, Cham. https://doi.org/10.1007/978-3-319-04996-0_72
- Hu, Z., Shan, W., Jiang, H. (2014). Based on the Drilling and High-density Resistivity Method to Research Landslide in the Permafrost Regions. In: Shan, W., Guo, Y., Wang, F., Marui, H., Strom, A. (eds) *Landslides in Cold Regions in the Context of Climate Change*. Environmental Science and Engineering(). Springer, Cham. https://doi.org/10.1007/978-3-319-00867-7_12
- Guo, Y., Shan, W., Zhang, C. et al. Monitoring of permafrost degradation along the Bei'an-Heihe Expressway in China. *Bull Eng Geol Environ* 80, 1–10 (2021). <https://doi.org/10.1007/s10064-020-01919-3>
- Shan, W., Hu, Z., Jiang, H., Guo, Y., Wang, C. (2013). Mechanism of Permafrost Landslide Based on GPS and Resistivity Surveying. In: Wang, F., Miyajima, M., Li, T., Shan, W., Fathani, T. (eds) *Progress of Geo-Disaster Mitigation Technology in Asia*. Environmental Science and Engineering(). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-29107-4_18
- Shan, W., Jiang, H., Hu, Z., Wang, C., Guo, Y., Zhang, C. (2014). Occurrence Mechanism and Movement Characteristics of Landslides in Bei'an to Heihe Expressway Area in China Under the Climate Change. In: Shan, W., Guo, Y., Wang, F., Marui, H., Strom, A. (eds) *Landslides in Cold Regions in the Context of Climate Change*. Environmental Science and Engineering(). Springer, Cham. https://doi.org/10.1007/978-3-319-00867-7_3
- Shan, W., Hu, Z., Jiang, H., Guo, Y., Wang, C. (2015). Environmental and Engineering Geology of the Bei'an to Heihe Expressway in China with a Focus on Climate Change. In: Lollino, G., Manconi, A., Clague, J., Shan, W., Chiarle, M. (eds) *Engineering Geology for Society and Territory - Volume 1*. Springer, Cham. https://doi.org/10.1007/978-3-319-09300-0_51
- Shan, W., Guo, Y. (2017). Retrospective and Prospects for Cold Regions Landslide Research (2012–2016) (WCoE 2014–2017, IPL-132, IPL-167, IPL-203, CRLN). In: Sassa, K., Mikoš, M., Yin, Y. (eds) *Advancing Culture of Living with Landslides*. WLF 2017. Springer, Cham. https://doi.org/10.1007/978-3-319-59469-9_27
- Wang, C., Shan, W., Guo, Y., Hu, Z., Jiang, H. (2014). Relative Factors of Beihei Highway's Ground Deformation Interpretation Based on Remote-Sensing Imagery Technology. In: Shan, W., Guo, Y., Wang, F., Marui, H., Strom, A. (eds) *Landslides in Cold Regions in the Context of Climate Change*.

- Environmental Science and Engineering(). Springer, Cham. https://doi.org/10.1007/978-3-319-00867-7_14
- Shan, W. et al. (2013). Landslide Mechanisms and Protection of Highways in Frozen Regions of Northeast China. In: Sassa, K., Rouhban, B., Briceño, S., McSaveney, M., He, B. (eds) *Landslides: Global Risk Preparedness*. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-22087-6_16
- Shan, W., Jiang, H., Guo, Y., Hu, Z., Wang, C. (2013). Landslides Characteristic of Northwest Lesser Khingan Range China. In: Margottini, C., Canuti, P., Sassa, K. (eds) *Landslide Science and Practice*. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-31337-0_47
- Hu, Z., Shan, W. Landslide investigations in the northwest section of the lesser Khingan range in China using combined HDR and GPR methods. *Bull Eng Geol Environ* 75, 591–603 (2016). <https://doi.org/10.1007/s10064-015-0805-y>
- Hu, Z., Shan, W., Jiang, H. (2018). TXT-tool 4.086-1.1: Landslide Investigations in the Northwest Section of the Lesser Khingan Range in China Using Combined HDR and GPR Methods. In: Sassa, K., Tiwari, B., Liu, KF., McSaveney, M., Strom, A., Setiawan, H. (eds) *Landslide Dynamics: ISDR-ICL Landslide Interactive Teaching Tools*. Springer, Cham. https://doi.org/10.1007/978-3-319-57777-7_32
- Hu, Z., Guo, Y., Shan, W. (2017). Landslide Investigations in the Northwest Section of the Lesser Khingan Range in China Using Combined HDR and GPR Methods. In: Mikoš, M., Vilímek, V., Yin, Y., Sassa, K. (eds) *Advancing Culture of Living with Landslides*. WLF 2017. Springer, Cham. https://doi.org/10.1007/978-3-319-53483-1_25
- Hu, Z., Shan, W., Jiang, H. (2015). The Deformation Monitoring of Superficial Layer Landslide in the Northern Part of Lesser Khingan Mountains of China. In: Lollino, G., Manconi, A., Clague, J., Shan, W., Chiarle, M. (eds) *Engineering Geology for Society and Territory - Volume 1*. Springer, Cham. https://doi.org/10.1007/978-3-319-09300-0_52
- Hu, Z., Shan, W., Jiang, H. (2014). Landslide Deformation Monitoring and Analysis of Influence Factors at K178 + 530 of the Bei'an to Heihe Expressway. In: Sassa, K., Canuti, P., Yin, Y. (eds) *Landslide Science for a Safer Geoenvironment*. Springer, Cham. https://doi.org/10.1007/978-3-319-04996-0_77
- Jiang, H., Hu, Z., Guo, Y., Wang, C., Shan, W. (2013). Cut Layer Rocky Landslide Development Mechanism in Lesser Khingan Mountain. In: Wang, F., Miyajima, M., Li, T., Shan, W., Fathani, T. (eds) *Progress of Geo-Disaster Mitigation Technology in Asia*. Environmental Science and Engineering(). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-29107-4_19
- Guo, Y., Canuti, P., Strom, A. et al. The First Meeting of ICL Landslides in Cold Regions Network, Harbin, 2012. *Landslides* 10, 99–102 (2013). <https://doi.org/10.1007/s10346-012-0369-x>
- Guo, Y., Shan, W., Hu, Z., Jiang, H. (2017). Cut Slope Icing Formation Mechanism and Its Influence on Slope Stability in Periglacial Area. In: Mikoš, M., Vilímek, V., Yin, Y., Sassa, K. (eds) *Advancing Culture of Living with Landslides*. WLF 2017. Springer, Cham. https://doi.org/10.1007/978-3-319-53483-1_21

- Guo, Y., Shan, W., Jiang, H., Sun, Y., Zhang, C. (2014). The Impact of Freeze–thaw on the Stability of Soil Cut Slope in High-latitude Frozen Regions. In: Shan, W., Guo, Y., Wang, F., Marui, H., Strom, A. (eds) Landslides in Cold Regions in the Context of Climate Change. Environmental Science and Engineering(). Springer, Cham. https://doi.org/10.1007/978-3-319-00867-7_7
- Guo, Y., Shan, W., Zhang, C., Sun, Y. (2013). Landslides and Moisture-Temperature for Cutting Slope Soil in Freeze-Thaw Cycles. In: Margottini, C., Canuti, P., Sassa, K. (eds) Landslide Science and Practice. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-31337-0_48
- Guo, Y., Shan, W. (2013). The Effect of Freeze–Thaw and Moisture on Soil Strength Index of Cutting Slope. In: Wang, F., Miyajima, M., Li, T., Shan, W., Fathani, T. (eds) Progress of Geo-Disaster Mitigation Technology in Asia. Environmental Science and Engineering(). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-29107-4_20
- Jiang, H., Shan, W., Hu, Z. (2014). Bedding Landslide Formation Mechanism and Traits in Lesser Khingan Mountain. In: Shan, W., Guo, Y., Wang, F., Marui, H., Strom, A. (eds) Landslides in Cold Regions in the Context of Climate Change. Environmental Science and Engineering(). Springer, Cham. https://doi.org/10.1007/978-3-319-00867-7_6
- Guo, Y., Shan, W., Zhang, C., Jiang, H. (2015). Landslide Mechanism and Shallow Soil Moisture of Soil Cut Slopes in Seasonally Frozen Regions. In: Lollino, G., Manconi, A., Clague, J., Shan, W., Chiarle, M. (eds) Engineering Geology for Society and Territory - Volume 1. Springer, Cham. https://doi.org/10.1007/978-3-319-09300-0_49
- Guo, Y., Shan, W., Jiang, H., Hu, Z. (2014). The Impact of the Shrub Roots on the Stability of Soil Cut Slope in Seasonal Frozen Regions. In: Sassa, K., Canuti, P., Yin, Y. (eds) Landslide Science for a Safer Geoenvironment. Springer, Cham. https://doi.org/10.1007/978-3-319-04996-0_71

13. If your organization is an ongoing WCoE 2020-2023, please attach the articles as pdf files reporting activities of WCoE, IPL project and ICL network published/contributed or a list of planned reports of WCOE 2020-2023 to either journal “Landslides” or/and “P-LRT books.”

(Those organizations with no activity report/no achievement in WCOE 2020-2023 will not be accepted as the candidate of WCOE 2023-2026 to be submitted to the Independent Panel of Experts for WCOEs.)

Note: Please fill and submit this form **by 30 March 2023** to **KLC2020 secretariat** <klc2020@iclhq.org>