Reply to reviewer 1#

Dear reviewer 1#：

We are very grateful to this referee comments, and have carefully read and considered the referee's comments, and these comments are important for improving the quality of this manuscript. Based on these comments, we have made carefully modification and proofreading on the original manuscript, the revised parts have been marked in red in revised version, and the detail modifications are shown in next chapter.

Thank you very much for your suggestion and consideration, and we look forward to hearing from you.

Best regards,

Yang Li, Daji Zhang and Yimin Liu.

Detailed revision:

(1)Modification: According to the reviewer's comments, we have changed the title of Figure 1 to: **Traditional methods for measuring deep displacement of landslides**.

(2)Modification: Thanks a lot for your kindness suggestion, we have added the following technical details in Section 2.1:

At present, the instrument can carry up to 32 measurement probe. Under deep hole conditions, the full hole inclinometer can be adapted to deep hole conditions by modifying the program, modifying the acquisition logic and communication protocol structure. However, if only the number of measurement probe is increased, the overall measurement cost will become very high. Therefore, in engineering applications, the method of increasing the length of flexible joints will dilute the probe density in fixed hole depths to reduce system application costs..

(3) Modification: According to the reviewer's comments, we also have added the following details of Technical parameters in Section 2.2:

The duration of each data acquisition and network transmission of the instrument is about 2 minutes, and the working current is about 200 milliamperes. The rest of the time is in a dormant state. Working every day consumes approximately 0.33 ampere hours of electricity. The power supply of the full hole inclinometer comes from a lead-acid battery located on the ground of the orifice. Considering the extreme situation where lead-acid batteries cannot be recharged after a continuous rainy month, using a 20 ampere hour lead-acid battery can ensure the redundant power consumption design of the system.

During each acquisition process, the full hole inclinometer can perform edge calculation and compare the current acquisition value with the previous acquisition value. If the collected values do not change or fluctuate within a certain range, the full

hole inclinometer can continue to collect and sleep at the predetermined collection frequency. If the collected value exceeds the range of variation, the full hole inclinometer will immediately carry out repeated collection. If it is determined that the collected value exceeds the limit, the full hole inclinometer will not sleep and will continue to collect and transmit until three consecutive data are stable before entering sleep. As a result, the system has implemented adaptive encryption collection logic.

(4) Modification: In Section 6 Conclusion, we have reorganized and summarized, and added some shortcomings, mainly due to increased precision limitations, such as:

while the accuracy for azimuth angle measurement is 1% F·S when the drilling top angle is greater than 3°.

Reply to reviewer 2#

Dear reviewer 2#：

On behalf of my co-authors, we thank you for giving us an opportunity to revise this paper, we appreciate editor and reviewers very much for their positive and constructive comments and suggestions on our manuscript. Based on these comments, we have made carefully modification and proofreading on the original manuscript. For the questions from reviewer 2#, I will explain in detail in the next chapter, and the detail modifications are also shown in red in revised version.

Thanks for your suggestions and comments. All your comments are very important. They have important guiding significance for our future research work, and we look forward to hearing from you.

Best regards,

Yang Li, Daji Zhang and Yimin Liu.

Detailed revision:

(1) The abstract section is slightly redundant, it is recommended to simplify and describe the shortcomings of existing technology.

Modification: According to the reviewer's comments, we have simplified the shortcomings of existing technology.

(2) Section2.2 just show the main technical parameters of the array, can you compare the technical indicators of the current measurement equipment?

Modification: Thanks a lot for your kindness suggestion, we have added the following technical parameters in Section 2.1 and Section 2.2, to show the superiority of our equipment:

The duration of each data acquisition and network transmission of the instrument is about 2 minutes, and the working current is about 200 milliamperes. The rest of the

time is in a dormant state. Working every day consumes approximately 0.33 ampere hours of electricity. The power supply of the full hole inclinometer comes from a lead-acid battery located on the ground of the orifice. Considering the extreme situation where lead-acid batteries cannot be recharged after a continuous rainy month, using a 20 ampere hour lead-acid battery can ensure the redundant power consumption design of the system.

During each acquisition process, the full hole inclinometer can perform edge calculation and compare the current acquisition value with the previous acquisition value. If the collected values do not change or fluctuate within a certain range, the full hole inclinometer can continue to collect and sleep at the predetermined collection frequency. If the collected value exceeds the range of variation, the full hole inclinometer will immediately carry out repeated collection. If it is determined that the collected value exceeds the limit, the full hole inclinometer will not sleep and will continue to collect and transmit until three consecutive data are stable before entering sleep. As a result, the system has implemented adaptive encryption collection logic.

(3) The Figure 3 doesn't seem very clear, I suggest redrawing it.

Modification: According to the reviewer's comment, we have redrawn the Figure 3 in Section 3.1.

(4) The Section 4, I suggest delete it, because it doesn't seem to have much to do with this article.

Explanation: In our opinion, the production and installation process in Chapter 4 is important for the research and development of our equipment, as well as its unique features, we hope you can reconsider keeping this part.

(5) The Figure 11, the labels and text in Figure 11 look too large. It is recommended to reduce them to match the previous image.

Modification: According to the reviewer's comment, we have reduced the Figure 11 in Section 5.3, to match the previous images.

(6) The Section 6 conclusion, I suggest further strengthening the induction and summary.

Modification: According to the reviewer's comment, we have reorganized and summarized the conclusion of Chapter 6:

When integrated with automated data acquisition equipment, continuous monitoring can be seamlessly automated. Furthermore, by strategically implementing multiple sensor arrays, we can acquire precise displacement magnitude and displacement orientation curves for numerous measurement points. This adaptable measurement configuration surpasses the constraints of traditional fixed inclinometers, which might offer limited probe quantities or suffer from inaccurate installation positions, thereby failing to accurately depict the landslide body's deformation trend. Additionally, it eliminates the requirement for supplementary installation accessories, such as pulleys and inclinometer pipes, consequently simplifying both the mechanical

structure and installation procedures.