

Comments

The manuscript presents the design and preliminary test results of a steerable system of RECAS for accessing and studying subglacial lakes. The designed sonde prototype can be used for directional ice drilling with a controllable electric thermal head, which is meaningful to enabling melt probe to follow a desired trajectory or bypass obstacles in the ice. Generally, the manuscript is well-written and can be published after minor revision.

- 1) The manuscript mainly discussed a steerable system developed for RECAS, which is not a real steering recoverable autonomous sonde (RECAS), so the title is suggested to be changed. For example, “*A steerable system of RECoverable Autonomous Sonde (RECAS) for accessing and studying subglacial lakes*” or “*A prototype of steering RECoverable Autonomous Sonde (RECAS) for accessing and studying subglacial lakes: Design and test*”.
- 2) Line 11 and Line 23: “Thermal sonde”, “hot-point” and “thermal drill” have similar meaning, please use the same name throughout the manuscript.
- 3) Line 56, 57 and 58: The melt probe IceMole can also perform directional drilling in ice, can you provide more information about the IceMole’s design in thermal head and its drilling performance. (References: *Curvilinear melting – A preliminary experimental and numerical study*; *IceMole: a maneuverable probe for clean in situ analysis and sampling of subsurface ice and subglacial aquatic ecosystems*)
- 4) In the manuscript, there are many names of the thermal head, such as “melting head”, “thermal head”, “drill head”, “melting tip”, “thermal drill head”, “thermal drill bit”, please use the same name throughout the manuscript.
- 5) Line 171 and 175: Is there any reference for the formula 5 and 6? How do you get the formulas?
- 6) Line 184: If the radii of curvature ensuring RECAS passibility is 300-600 m, is it means that the RECAS is very difficult to bypass obstacles in the ice unless the RECAS start to deviate before a long distance to the obstacles? If yes, please clarify.

- 7) Figure 10: What is the function of the limiter?
- 8) Figure 11: It would be better if the photo can show the full thermal head, such as pressure chamber, thermal sensor and power connector etc.
- 9) Line 288: “Dual axis inclinometer” or “two-axis inclinometer”? Please use the same name.
- 10) Line 311: Polar Research Center laboratory of Jilin University?
- 11) Line 334: How much is the 50% power and how much power is increased?
- 12) Figure 15: It is better to have depth data in the figure.
- 13) Line 342-344: After the four heater pairs on the opposite side were switched on, the inclination angle decreased to nearly zero and then gradually increased in opposite direction? If so, please clarify.
- 14) Line 364-373: The two paragraphs should be part of the section of 5.3, which shows how you perform the four experiments. In section 5.2, only the preliminary test procedure and test results should be included.
- 15) Line 369: Please present more information about “automatic alignment mode”? How do you control the power? How the power changed?
- 16) Line 434: What kind of RECAS parameters?
- 17) Line 444: The steering capability of melt probe can be used to maintaining verticality within the desired range or bypass obstacles in the ice. However, according to the research, it looks that a long melt probe is difficult to bypass obstacles in the ice because of its large radii of curvature. In RECAS situation, do you have other methods to bypass obstacles in the ice except for hinged joints?

Technical issue:

In the manuscript, the word “deviational” was used to describe non-vertical ice drilling process. However, Zagorodnov use the word “directional”. Please check the exact expression of this term.

(Zagorodnov V S, Kelley J J, Koci B R. Directional drilling. Memoirs of National Institute of Polar Research, 1994, Special issue 49:165-171.)