Supporting information of the manusript

**A Novel Instrument for Bed Dynamics Observation Supports Machine Learning Applications in Mangrove Biogeomorphic Processes**

**Z. Hu1,2, J. Zhou1, C. Wang3, H. Wang1, Z. He1, Y. Peng2,4, P. Zheng5 F. Cozzoli6,7, T.J. Bouma8**

1 Guangdong Provincial Key Laboratory of Marine Resources and Coastal Engineering, and School of Marine Science, Sun Yat-sen University, Guangzhou, China.

2 Southern Marine Science and Engineering Guangdong Laboratory (Zhuhai), China.

3 Satellite Application Center for Ecology and Environment, Ministry of Ecology and Environment, and State Environmental Protection Key Laboratory of Satellite Remote Sensing, Beijing, China.

4 School of Environmental Science and Engineering, Sun Yat-Sen University, Guangzhou, China.

5 College of Oceanic and Atmospheric Sciences, Ocean University of China, Qingdao, China

6 Dipartimento di Scienze e Tecnologie Biologiche ed Ambientali, University of the Salento – 73100, Lecce, Italy.

7 Research Institute on Terrestrial Ecosystems (IRET) - National Research Council of Italy (CNR) via Salaria km 29.3 – 00015 Monterotondo Scalo (Roma), Italy.

8 Department of Estuarine and Delta Systems, Royal Netherlands Institute of Sea Research (NIOZ) and Utrecht University, Yerseke, The Netherlands.

Corresponding author: Yisheng Peng ([pyish@mail.sysu.edu.cn)](mailto:pyish@mail.sysu.edu.cn))

Peng Zheng ([zhengpeng@ouc.edu.cn](mailto:zhengpeng@ouc.edu.cn))



Figure S1. a) the design of the LSED-sensors with Measurement components (M) and Supporting components (S). The indicated size is in mm (not to scale). M1 are laser probes; M2 is a LED screen; M3 is battery; M4 is a circuit board; S1 is a transparent organic glass tube; S2 is an aluminum alloy plate; S3 are silicone rings; S4 are fixed wheels; S5 is a leveling bubble; S6 is a GPS module; S7 is a Bluetooth antenna. c) 'amplified' -> 'detailed'



Figure S2. Details of the circuit board M4 (M5, M6), including M5 - Bluetooth communication module and M6 – cellular (4G) communication module

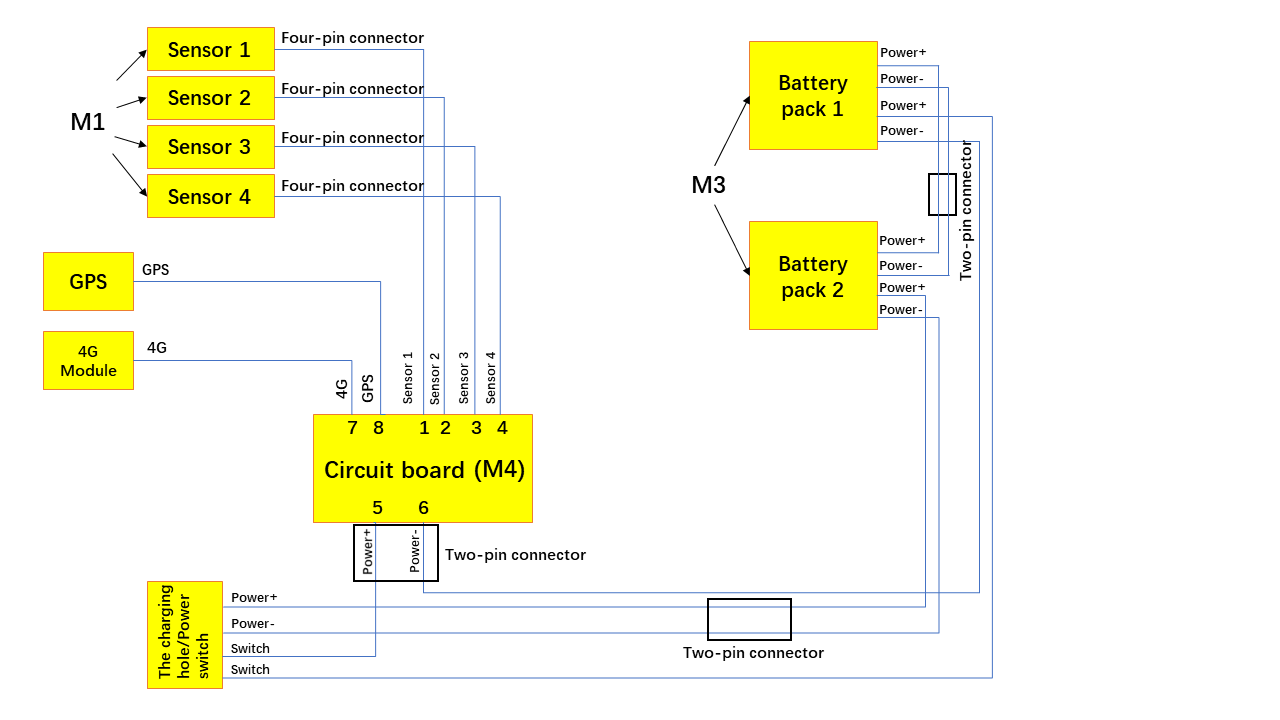


Figure S3. The wiring diagram of the LSED-sensor, illustrating how the parts were connected

Table S1. Bill of the main materials of the LSED-sensor

|  |  |  |  |
| --- | --- | --- | --- |
| Materials | Number. | Sources | Price ($) |
| Laser probe | M1 | Senky Laser  (http://senkylaser.dzsc.com/) | 115 |
| LED screen | M2 | P-NAV TECH  (http://www.p-nav.com.cn/) | 40 |
| Lithium battery | M3 | P-NAV TECH | 840 |
| Circuit board | M4 (M5, M6) | P-NAV TECH | 1125 |
| Transparent organic glass tube | S1 | Material market (-) | 210 |
| Aluminum alloy plate | S2 | Material market (-) | 490 |
| The sealing plug | S8 | P-NAV TECH | 420 |