Claims

1. A monitoring device comprising two or more monitoring modules electrically connected in series; and a control box electrically connected to the two or more monitoring modules, each monitoring module comprises a first line of sensors adapted to determine a profile of a bore within the ground or a structure along a length of the first line of sensors, wherein the first line of sensors comprises at least one inertial measurement unit (IMU) disposed along a flexible substrate, a processing unit, each IMU is electrically connected to the processing unit, the processing unit comprises: an embedded processor with signal processing, a data transceiver for receiving and transmitting data to the control box, and a power converter.

2. The monitoring device according to claim 1, wherein the monitoring module further comprises a second line of sensors connected in parallel to the first line of sensors.

3. The monitoring device according to claim 2, wherein the second line of sensors comprises at least one sensor selected from the group comprising of: a water pressure sensor, a pore water pressure sensor, a pH sensor, a sound level detector, a gas sensor, a salinity sensor, and a temperature sensor.

4. The monitoring device according to any one of the preceding claims, wherein the first line of sensors comprises 16 or less equally spaced apart inertial measurement units.

5. The monitoring device according to any one of the preceding claims, wherein there at least two inertial measurement unit, each 0.5 metres apart.

6. The monitoring device according to any one of the preceding claims, wherein the length of the flexible substrate is 8 metres or less.

7. The monitoring device according to any one of the preceding claims, wherein the inertial measurement units in each line of sensors are connected in series.

8. The monitoring device according to any one of claims 2 to 7, wherein the first and second lines of sensors are each housed in a housing.

9. The monitoring device according to any one of the preceding claims, wherein each module is connected to each other in series.

10. The monitoring device according to any one of the preceding claims, wherein the control box further comprises a GPS module.

11. The monitoring device according to any one of the preceding claims, wherein the control box further comprises a power source connected to the power convertor, the power source is a fuel cell or a solar cell.

12. The monitoring device according to any one of the preceding claims, further comprising a ground line of sensors electrically connected to the control box, disposed on a surface of a ground or structure to be monitored.

13. The monitoring device according to claim 12, wherein the ground line of sensors comprising at least one sensor selected from the group comprising of: a water pressure sensor, a pore water pressure sensor, a pH sensor, a sound level detector, a gas sensor, a salinity sensor, and a temperature sensor.

14. A monitoring system comprising:
    (a) at least one monitoring device according to any one of claims 1 to 13; and
    (b) a central unit,

    wherein the central unit comprises a communications module for receiving and transmitting data from the at least one monitoring device.

15. The monitoring system according to claim 14 comprising an aggregator device, wherein the aggregator device serves as an intermediary between the at least one monitoring module or at least one device and the central unit.

16. A method for monitoring, the method comprising:
    (a) obtaining data from at least one device according to any one of claims 1 to 13; and
    (b) determining a position of each inertial measurement unit relative to each other to determine the profile of the first line of sensors.

17. The method according to claim 16, wherein obtaining the data is based on a time schedule, triggered by an event, or upon a user's request.