The inelastic neutron scattering (INS) instrument is based on INS- and thermal neutron capture-induced gamma ray spectroscopy. Due to nuclear reactions involved it is element specific, independent of its chemical state, and

The INS key system characteristics are:

1. In Situ, Non-destructive.
2. Large footprint, of about 2 m²; large sampling mass, >200 kg, to a depth of about 30 cm.
3. Provides multi-elemental analysis, e.g., H, C, N, O, P, Cl, Na, K...
4. Can be operated in a stationary and continuously scanning modes.
5. Instantaneous results at the end of the data acquisition time.
6. Provides true multilevel, spot, transact and aerial, temporal measurements.
7. Operators under complete soil water saturation conditions with water layer.
8. Can be redesigned as a subsurface unit.

Thus: The INS revolutionizes the wisdom of the conventional sampling paradigm with an extensive reduction in labor, time, and costs.

New Applications of the INS System in the Estuarine:
- Surveys of large scale regional coastal carbon mapping.
- Validation of modeling complex sediment processes; dynamics and transport, for models and policy making decisions.
- Direct measurement of the effects of major disturbances on the seabed characterization.
- Calibration of satellite images and aircraft CO₂ flux maps with coastal area assessment using INS on identical pixel size.
- Independent validation of data bases.
- Extensive reduction in labor, time and cost in carbon and other elements mapping over large areas.
- Complements assessment of the soil carbon as determined by flux measurements that underestimate lateral (surface) flows.

New Applications of the INS System in the Forest:
- Integration into US Geological surveys for large scale regional soil carbon mapping.
- Independent joint measurements to improve the carbon data base required for modeling carbon climate change in support for policy making decisions.
- Independent assessment of the changes in the carbon predictions made by the FACE and AmeriFlux facilities.
- Independent validation data for the “bottom-up” approach in order of reducing the discrepancy with the “top-down” approach.
- Possibly calibrating satellite land images with large scale area assessment with INS.

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