Non-Destructive Field Scanning for Belowground Carbon Using an INS System

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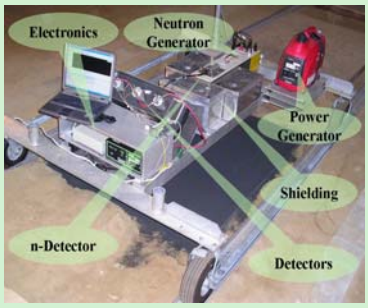
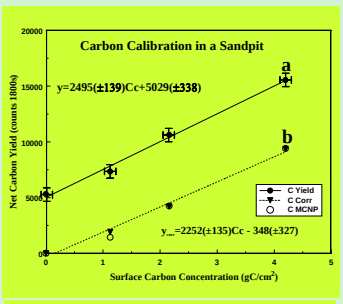
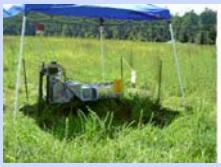


INS Alpha prototype used for stationary and scanning field measurements.

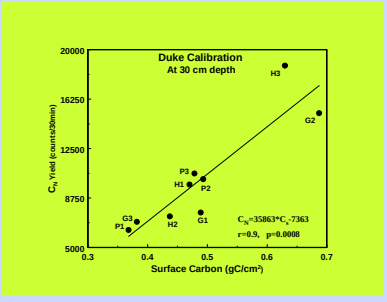
Sandpits, 1.5x1.2x0.46 m^3, for synthetic soil preparations.



Calibration Lines; N_C-net counts in the carbon peak (a), C_N-carbon net counts after interference correction (b).
Interference Correction
$C_N = N_C$ – Cascade – SEP

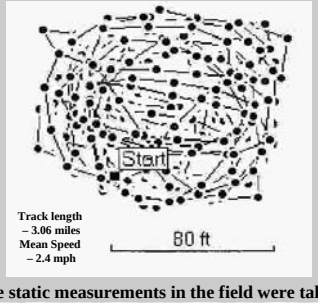


Measurement sites at Duke Forest NC.
Pits 40x40x40 cm^3 were excavated for C analysis.

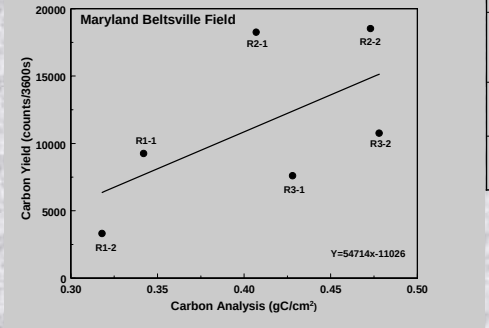


Duke Forest calibration, the three sites; G-Grass, P-Pine, and H-Hardwood were combined. The sits were covered with standing water and the solid fraction approached 30%.

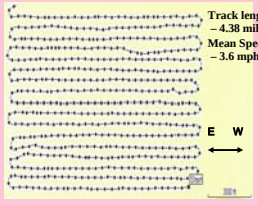
Carbon Yield for 1800 s in Alabama Soil Bins			
	Mean Static Counts	Dynamic Counts	Difference In SD
Hiwassee Clay (V_1)	3830	4676	$5.1\sigma_{n-1}$
Vaiden Silty Clay ($2V_1$)	8775	5986	$-1.4\sigma_{n-1}$
Hiwassee Sandy Loam (Random V)	3447	2403	$-1.0\sigma_{n-1}$



Maryland corn field and GPS trace of a scan, in addition three static measurements in the field were taken.



Field Predition by Three Methods		
Dry Combustion LECO	0.407	13.5%
LIBS	0.327	25%
INS	0.257	19%



Montana wheat field and GPS trace of a scan, in addition three static measurements in the field were taken.

Summary of the INS System:

- INS system is totally non destructive.
- INS system can perform static and scanning measurements.
- INS measures large volumes and large areas.
- INS enables sequential measurements.
- Integration into US Geological surveys for large scale regional soil carbon mapping.
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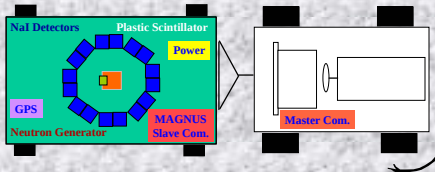
- Monitoring large area disturbances.



Beta prototype to be deployed in summer 2007