Abstract:

Mapping the spatial patterns of field traffic and traffic intensity by means of GPS-data received from farm vehicles.

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Soil compaction is one of the main threats of arable soils in present days. In contrast to easily visible phenomena of soil degradation, soil compaction, however, is obscured by other signals such as reduced crop yields, delayed crop growth, and the ponding of water, which makes it difficult to recognize and locate areas impacted by soil compaction directly. Although it is known that trafficking intensity is a key factor for soil compaction, until today only modest work has been concerned with the mapping of the spatially distributed patterns of field traffic and with the visual representation of the loads and pressures applied by farm traffic within single fields.

A promising method for the spatial detection and the mapping of soil compaction risks for individual fields is to process GPS data, collected from vehicle-mounted GPS receivers. The application of user generated data like these, enables the mapping of vehicle movements over time as well as the assessment of trafficking intensity. It also facilitates the calculation of trafficked areas and the modeling of the loads and pressures applied to the soil by the individual vehicles. In this way, 2D- or 3D-maps generated from out these data can support decision making for a more sustainable field traffic management in order to mitigate soil compaction.

This paper aims at the mapping of the modeled patterns of traffic intensity as related to soil compaction in silage maize fields during harvest, by considering the spatio-temporal changes in wheel load and ground contact pressure along the loading sections. In addition to scenarios calculated for varying mechanical soil strengths, an example for the 3D-visualisation of stress propagation downwards the soil will be given, using the Visualization Toolkit (VTK) (see http://www.vtk.org/) in order to construct maps of the subsoil tomography at the field scale.