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Vadose-zone profiles under cultivated land overlaying the Israeli coastal aquifer

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The Mediterranean coastal aquifer in Israel is a water-table aquifer located under intensively cultivated land ($\sim$45% of aquifer outcrop area). Vadose-zone is relatively thick (mostly 10-50 m). Soils and deeper unsaturated sediments vary from pure sands and calcareous sandstone through orange sandy-loam (Hamra) to heavy alluvial Vertisols (Grumosol). Some aquifer water-quantity and quality dynamics may be affected by agricultural activity on its outcrops. Vadose-zone data is required to characterize, model and predict the aquifer responses, hence, examples of profiles under different agricultural activities and soil types that were collected in different projects will be presented and interpreted to various levels.

Vadose zone flushing (groundwater salinization) in response to land use change from natural land to irrigated field crops over Vertisols in the southeastern part of the aquifer will be demonstrated through profiles ($\sim$10 m depth) obtained with a direct push rig under these two land uses and simulations of unsaturated flow and chloride transport based on models calibrated to the measured profiles. Short range spatial variability in profiles obtained under citrus orchards will demonstrate the complexity of developing land-use based models. Differences in profiles of chloride, nitrate and dissolved organic carbon, in light, medium and heavy soil profiles will be discussed in light of the nitrate contamination plume distribution in the aquifer (mostly under light and medium soils).

Results of more than a year of continuous monitoring of deep water-contents and pore-water sampling with a unique vadose zone monitoring system installed at four sites: 1) a citrus orchard and 2) an adjacent rain-fed crop-field. 3) A conventional vegetable greenhouse and 4) an adjacent organic vegetable greenhouse. Differences in vadose zone profiles under the different agricultural land uses and practices will be demonstrated and discussed (e.g. higher nitrate loses under rain-fed field than under the orchard, versus larger vadose-zone chloride accumulation under the orchard).