Estimates of Groundwater Recharge, Flowpaths and Residence Times in a Coastal Aquifer of Oman - A Hydrogeochemical Approach -

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The alluvial aquifer beneath the Batinah Coastal Plain of Oman supplies water for the most densely populated, cultivated and industrialized areas in the Sultanate. Overexploitation of this groundwater resource has resulted in seawater intrusion into the coastal aquifer, raising concern about the long-term quality of the aquifer. In an attempt to derive a water budget and to develop a sustainable water management strategy, this study investigates the sources of recharge and the subsequent groundwater evolution along various flowpaths using a hydrogeochemical approach including isotopic data of O, H, C, and Sr from more than 200 wells. For reliable estimates on groundwater residence times, we used a combination of several radionuclides with different half-lifes and different input functions (i.e. ^{3}H, ^{85}Kr, ^{39}Ar, ^{14}C) and CFC measurements. Oxygen and strontium isotopes indicate that the main source of recharge to the coastal plain is high altitude rainfall from the neighboring Oman Mountains, while recharge on the plain itself appears to be negligible. The isotopically depleted water from the mountains forms two relatively narrow 'plumes' that stretch across the coastal plain, thereby maintaining their homogeneity vertically and horizontally. In contrast, in areas adjacent to these two plumes the aquifer is stratified with three chemically and isotopically distinct aquifer units. Groundwater samples from the shallow aquifer (<50 m) all contain tritium, indicating recent recharge, while groundwater in the deeper aquifer (> 300m) has recharged sometime around the Last Glacial Maximum (21,000 yr BP). Groundwater samples from the intermediate aquifer appear to be a rather complex mixture of the Late Pleistocene and the modern groundwaters together with variable amounts of seawater from the saline intrusion wedge.