The Iberá wetlands are formed by marshes, swamps and lagoons, covering 13200 km$^2$ in NE Argentina. The system lies on top of a Pliocene-to-present alluvial fan of the Paraná River. Alluvial sediments consist on quartz sandy bars, eolian dunes and clay layers thickening from NE to SW, overlying basalts to the NE and centre, and sandy silts and sands to the W and S. Permanent and seasonally flooded wetlands seems to be supplied by rain and groundwater, with a single river outlet (Río Corriente) discharging into the Paraná River in the southwest. However, the hydrodynamics of the surface/groundwater relationship has not been yet explored. Two sampling surveys (2009 and 2010) of surface and groundwaters allowed the first chemical and isotopic characterization of the different aquifer layers, and to assess wetlands water sources and surface-groundwater relationships. Shallow and 60-80m deep groundwater are of the Na-HCO$_3$ type, displaying a negative salinity gradient from NE to SW which, according to the geology, could be the main flow direction. The most mineralised and old groundwater (almost none $^{14}$C), also of the Na-HCO$_3$ type, is located in deep, confined sandstone formations under basalts towards the SE. Both vertical hydraulic gradients and chemical and isotopic features of the shallow aquifer located above the basalts indicate the existence of upward groundwater flow, which suggest the possibility of deep groundwater discharging to the wetlands. All surface waters sampled seem mostly rain water, but small differences in $^{222}$Rn activities among them prevent to discard the presence of groundwater signature.