Abstract. We have performed a combined analysis of X-ray and Sunyaev-Zel'dovich data in the direction of the distant galaxy cluster, RX J2228+2037. Fitting a β-model to the high-resolution HRI data gives $r_c = 103 \pm 12\, h_{70}^{-1}$ kpc and $\beta = 0.54 \pm 0.03$. The dependency of the Sunyaev-Zel'dovich effect with respect to the gas temperature allows us, through the additional use of the 21 GHz data of the cluster, to determine $k_B T_e = 10.4 \pm 1.8\, h_{70}^{1/2}$ keV. Extrapolating the gas density profile out to the virial radius ($R_v = r_{178} = 2.9$ Mpc), we derived a gas mass of $M_g(r < R_v) = (4.0 \pm 0.2) \times 10^{14}\, h_{70}^{-5/2}\, \mathrm{M}_\odot$. Within the hypothesis of hydrostatic equilibrium, the corresponding extrapolated total mass for this source is: $M_{tot}(r < R_v) = (1.8 \pm 0.4) \times 10^{15}\, h^{-1}\, \mathrm{M}_\odot$, which corresponds to a gas fraction of $f_{gas} = 0.22 \pm 0.06\, h_{70}^{-3/2}$. Our results on the temperature and on the cluster mass classify RX J2228+2037 among the distant, hot and very massive galaxy clusters. Our work highlights the power of the association of galaxy cluster mapping observations in X-ray and the SZ effect to derive the cluster's physical properties, even without X-ray spectroscopy.

Key words: Cosmology: observation – Galaxies: clusters: individual: RX J2228+2037 – Intergalactic medium