Abstract

There is an interesting similarity between the gravitational dynamics of horizons and thermodynamics. It has been shown that the near horizon structure of the field equation can be cast as a thermodynamic identity $TdS = dE_h + PdV$ arising from the virtual displacement of the horizon normal to itself. We study this approach further and extend it to a more general black hole geometry which contain scalar hair also. Then by considering two exact dilaton black hole solutions, we check if this form of the first law is consistence with the ordinary first law of black hole thermodynamics.