Advances in the compilation of atmospheric and climate sciences databases from observations and model simulations help to define trends and variability of the modern and past atmospheric conditions and increase models predictability skills. In this paper we present a simple methodology that allows to track and to compare the temporal evolution of variables based on their 3D distribution. Simplicity in calculation of the new diagnostic, which we named Volume Variability, and its transparent interpretation as a product of variances along a set of directions, allow it to be used as a metric for easy and quick comparison of the 3D time series of models and observations. Using this methodology we explore the evolution of the temperature and geopotential height fields over the Southern Hemisphere Cap region using four reanalysis systems.