It is important to study volcanoes during both eruptive episodes and periods of quiescence. Volcanic deformation and degassing occurs during both phases and understanding the characteristic behaviour of volcanoes during these periods can help identify the transition from one state to another. This study incorporates InSAR and soil gas measurements at Santorini volcano, to better understand the nature of this renowned stratovolcano in its current state of dormancy. We utilise C-band (5.65 cm wavelength) radar data acquired between 1993 and 2010 to measure deformation rates at Santorini. CO$_2$ soil gas samples were acquired on both the islands of Thera and Nea Kameni using the accumulation chamber method. These surveys were undertaken as an assessment of CO$_2$ degassing rates and to determine whether or not this technique may be used to locate active faults and fractures. Preliminary findings from InSAR show deformation rates of approximately 1 cm/yr at Nea Kameni. Variations in CO$_2$ flux from 3 soil gas surveys, acquired between April 2010 and April 2011, are analysed using various geostatistical techniques to determine variations in magmatic and biogenic components and to estimate total CO$_2$ emission rates. Source modelling is undertaken to determine the optimal parameters for the source of the deformation observed and comparisons are made between InSAR measurements and CO$_2$ effluxes to better constrain the physical processes involved.