Local ground displacement at Pozzuoli Solfatara (Naples, Italy) and reactive gas abundance evolution

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In the year 2001, a team from the Institute of Geosciences and Earth Resources working in the Phlegrean Fields area (fig. 1) began a new survey by systematic sampling of the fluids emerging from the Pozzuoli Solfatara, and particularly from the fumarole known as Bocca Grande; the same team did a similar survey from 1982 to 1985, while Cioni and his co-workers monitored the same parameters in the area from 1982 to1997 and Martini from 1994 to 2000.

The results of chemical analyses of the most reactive gases, such as H_2, CH_4, and H_2S, from 2001 until 2005, have revealed a trend that is shown in the triangular diagram (figs. 3, 4, 6).

The main feature of this trend is the temporal evolution of the chemical composition of the above gases at Pozzuoli Solfatara during the period 2001-2005, which indicates a gradual return to the same gas compositions measured during the period 1983-1985, with a significant increase in the bradyseism. The chemical composition of these gases reached values very similar to the current values (fig. 6) in coincidence with the maximum displacement of bradyseism recorded at the end of 1984 (fig. 2).

A similar trend in gas chemical composition can also be observed for the period from 1989-1997 and 1998-2000. Comparisons of triangular diagrams H_2, CH_4, H_2S (figs. 3, 4, 6) with the plot of altitude variations available up to 2003 (fig. 2) and 2006 (fig. 5) reveal a correspondence between the evolution of relative gas concentrations and the trend of bradyseism.

On the basis of the data available, we can observe a typical trend characterized by a relative increase of H_2S and decrease of CH_4 during the phase of bradyseism changing tendency. Monitoring of Solfatara area is in progress from this point of view also. The apparent correspondence between temporal evolution of gas chemical composition and bradyseism tendency, if confirmed, would corroborate the role of geochemical monitoring of these parameters in the prediction and of bradyseismic phenomena.

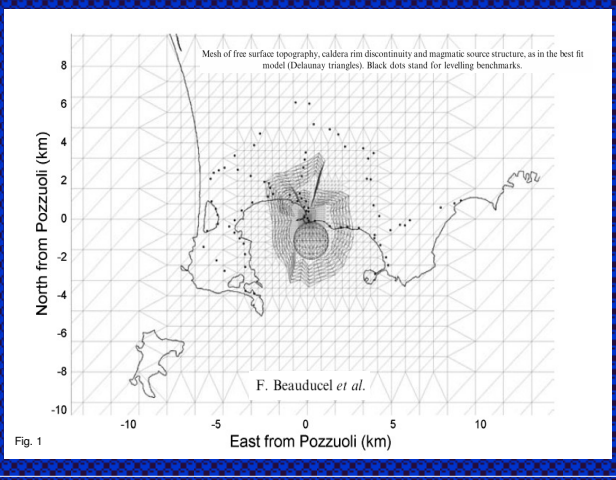

Fig. 1

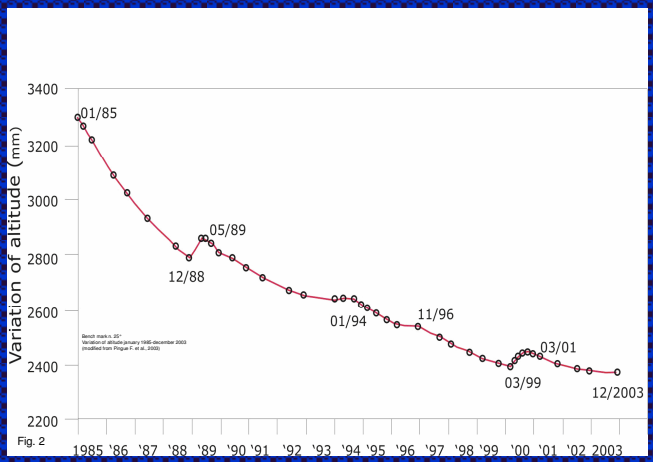

Fig. 2

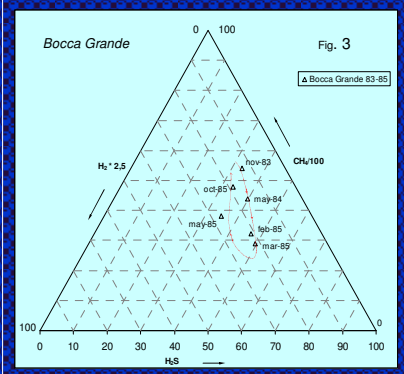

Fig. 3

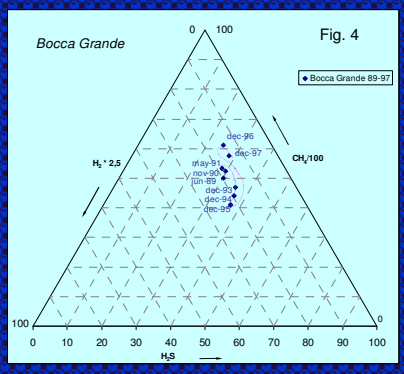

Fig. 4

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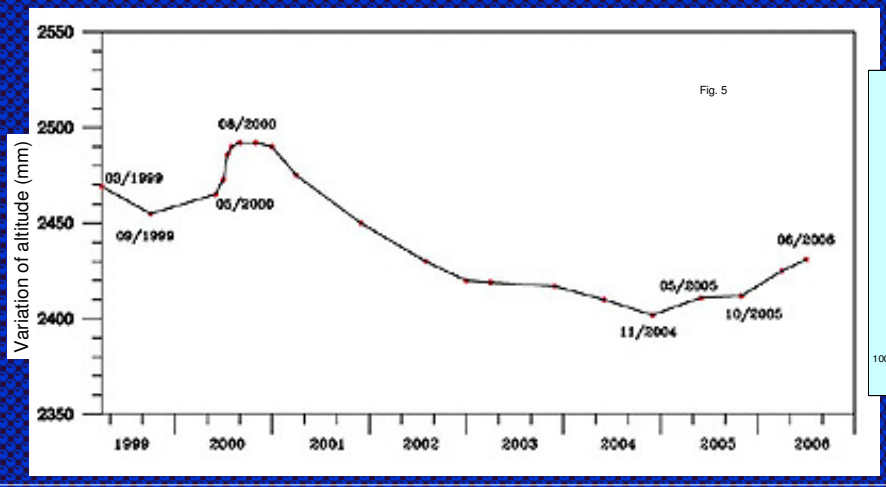

Fig. 5

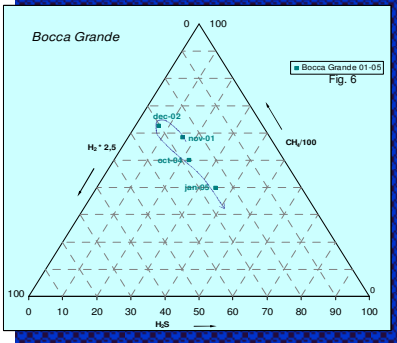

Fig. 6