

June 3, 1991 at Shimabara City Hall, Nagasaki Prefecture: An emergency situation occurred a little past four o'clock in the afternoon when pyroclastic flows hit the city. Male city workers, who were called in on very short notice and quickly allocated to their emergency tasks, disappeared, scattering into the darkness of the stuffy night with the burning smell of volcanic ash to assume each individual responsibility. It was the beginning of all the following disaster countermeasures taken against Mt. Unzen (Fugendake) eruptions that lasted over five years, which none of the workers at Shimabara City Hall had ever experienced before. From the day 43 people died in the disaster, all city workers had to run about in confusion day after day, involved in preparing evacuation sites for as many as four thousand residents who were forced to evacuate suddenly, receiving and distributing enormous volumes of aid supplies arriving every day and so forth. In the meantime, staff at the headquarters had to be on night duty, monitoring pyroclastic flows on screen in the disaster countermeasures office over four years. During that time, various measures for occupational safety and health were taken at disaster sites, including measures for overwork and health damage prevention among personnel engaged in disaster measure operations, safety measures for jobs in dangerous areas within the reach of pyroclastic flows and others. Nowadays, the above-mentioned can be recognized as the key factors in risk management at the time of the disasters caused by eruptions from Mt. Unzen (Fugendake). We will consider appropriate measures for occupational safety and health management in times of disaster by referring to the health survey results and various approaches practiced for city workers at Shimabara City Hall, who experienced an unprecedented, long-term volcanic disaster.

### 13-O-04

#### Psychiatric Problems Among Citizens During the Unzen Eruption

Akinori Takagi<sup>1</sup>

1. Takagi Psychiatric Hospital Shimabara / Japan  
e-mail: akinori@takagihp.or.jp

I will talk about the psychiatric problems examined and treated at Takagi hospital mainly in Shimabara city during the eruption of Unzen volcano. Unzen volcano became active on November 17th 1990. The volcanic activity affected the area in which many people had lived in Shimabara city and Fukae town and the citizens had to live with enormous fear and insecurity. Many people had to quickly evacuate their homes. Some people lost their homes to fire, farmers lost rice and vegetable fields and tea plantations. Under these circumstances I examined and treated 27 people with psychiatric problems. Thirteen of these people suffered from a marked increase in dementia. Three people had phobic anxiety disorders and two of these three died. Three people had generalized anxiety disorder and four people with delusional disorder and four people with depressive episode.

Notable features are: 1) Fifty-nine percent of the 27 people were over 70 years old. 2) All the thirteen people who suffered from dementia had strong symptoms appear after evacuation while being housed at the emergency evacuation sites. 3) Seventy percent of the people with dementia were women. 4) The dementia was so strong that it was difficult to treat them outside of the hospital. 5) Four people suffered from suicidal thoughts and one of

these four attempted suicide. 6) People who had physical or mental disease and were fragile prior to disaster were affected strongly by it, i.e., the elderly, people living alone, people with a prior history of apoplexy, with dementia, with diabetes and, neurotic people were particularly at risk.

### 13-O-05

#### Health Hazard From Endogenous Gas Emissions In Alban Hills (Rome, Italy)

Maria Luisa Carapezza<sup>1</sup>, Franco Barberi<sup>2</sup>, Peter Baxter<sup>3</sup>

1. Ist. Naz. Geofis. Vulcanol, Roma 1, Rome / Italy

2. Dip. Sci. Geol., Univ. Roma Tre, Rome / Italy

3. Inst. Publ. Health, Univ. Cambridge / UK

e-mail: carapezza@ingv.it

The quiescent volcano of Alban Hills, near Rome, is characterized by strong emission of endogenous gas (mostly CO<sub>2</sub> with minor H<sub>2</sub>S) from zones (e.g. Cava dei Selci and Solfiorata) where excavation removed the superficial impervious cover. These gases - denser than air - accumulate in morphological depressions and many lethal accidents to animals and also to one person have occurred in the last years. Another hazard is related to gas blowouts from boreholes reaching gas pressurized shallow aquifers. In order to evaluate the gas health hazard of the area, several geochemical surveys were performed measuring the CO<sub>2</sub> and H<sub>2</sub>S soil release and air concentrations. In the urbanized area of Vigna Fiorita, dangerous indoor conditions were found with [CO<sub>2</sub>] up to 10 % and [H<sub>2</sub>S] up to 30 ppm. Lethal indoor [CO<sub>2</sub>] (up to 22%) persisted within a non-ventilated house. Results will help in suggesting appropriate prevention measures to be adopted by residents. An important discovery was found measuring CO<sub>2</sub> and H<sub>2</sub>S air concentration (by TDL at 30 cm from the ground). In periods of very low or no wind (generally in night-time) lethal concentrations were reached by H<sub>2</sub>S both at Cava dei Selci (up to 400 ppm average concentration on a 40m long profile) and at Solfiorata (up to 350 ppm average concentration on a 118m long profile). These data indicate that the many animal deaths occurred in these years and previously attributed to CO<sub>2</sub> were instead caused by H<sub>2</sub>S as indicated by the first results of a specific study on the health effects of this gas on man and animals. Alban Hills test site provides useful methodological indications on how to assess the insidious hazard associated to soil gas release in inhabited zones of quiescent or recent volcanoes.

### 13-O-06

#### The Health Impacts of Persistent Degassing at Nyiragongo Volcano (DR Congo)

Simon Carn<sup>1</sup>, Francois Kervyn<sup>2</sup>, Prudence Mitangala<sup>3</sup>, Georgina M. Sawyer<sup>4</sup>

1. Joint Center for Earth Systems Technology, Univ. of Maryland Baltimore County / USA

2. Department of Geology, Royal Museum for Central Africa / Belgium

3. Centre Scientifique et Médical de l'Université Libre de Bruxelles pour ses activités de Coopération (CEMUBAC) / DR Congo

4. Department of Geography, University of Cambridge / UK

e-mail: scarn@umbc.edu