SUPERVOLCANOES: TALK BY PROFESSOR RAY CAS OF MONSAH UNIVERSITY
Wednesday 26 July, 2006

Professor Ray Cas' talk had the subheading "beware the sleeping giants" which is apt as no-one has experienced the eruption of a supervolcano (also known as an explosive caldera volcano) in historic times. However there is plenty of evidence for their devastating eruptions in the past, and during his talk, Ray indicated likely spots for future eruptions and tried to assess their potential effects on us and the planet as a whole.

Our speaker started with a diagram showing the relative size and shape of all the common types of volcano but with explosiveness increasing towards the top. At the bottom was the huge but relatively benign bulk of Hawaii. Somewhere in the middle were our western Victorian maars and in the same vicinity the typical cone-shaped composite volcanoes such as Mount Fuji. Composite volcanoes have alternating layers of ash and lava and it is their steepness that can give rise to fast moving pyroclastic flows. At the top were the supervolcanoes, among them Lake Taupo in New Zealand with a diameter of 35km, Yellowstone, 60km, and the biggest, Lake Toba in Sumatra which has an oblong shape stretching 90km. What stood out in the diagram was that in profile these supervolcanoes are 'inverse' - so much material had been blasted out of them that they are geographic depressions often occupied by lakes.

It was these supervolcanoes that Ray concentrated on. They consist of a roughly circular caldera of the dimensions given above which represents the subsidence of the volcano's floor into the magma chamber beneath. These eruptions are characterised by huge amounts of ash blasted into the air and pyroclastic flows travelling as far as 200km. Pyroclastic flows are mixtures of hot gas, ash and rocks which behave like a fluid and move very quickly.

Ray listed the potential hazards of such eruptions as follows:
1 Ash and gas affecting global weather.
2 The destructive effects of ash fallout.
3 Huge pyroclastic flows.
4 Possible tsunamis.

Looking at these hazards more closely, the suspended fine ash and aerosol gases (e.g. droplets of sulphuric acid) reach the stratosphere where they reflect incoming solar radiation. This leads to global cooling and, if it actually happened, crop failure and acid rain particularly in the temperate zones. It is believed that the eruption of Lake Toba 73,000 years ago tipped the Earth's climate into an ice age. The effects of ash fallout are well documented: for example 1mm of ash is sufficient to close airports, 10cm causes roof collapse and 10m leads to long-term loss of land use. Pyroclastic flows destroy all in their path; the well-known footage from an eruption of Mount Pinatubo in the Philippines shows a vehicle racing a 100kph flow which travelled 15km. Tsunamis can be triggered in various ways including pyroclastic flows hitting sea water as was the case with Krakatoa.

Ray next looked at the geological history of some of these supervolcanoes. Yellowstone has been active for 2 million years and has erupted three times spaced at 600,000-year intervals. The last one was 630,000 years ago; ash fallout reached the Gulf of Mexico. The recent BBC telemovie about a Yellowstone eruption was quite accurate in Ray's opinion. Lake Taupo in New Zealand erupts every 2000 years and the last eruption was in 186AD. Very worrying in terms of population density is Campi Flegrei which is the circular feature occupied by the Bay of Naples which has Vesuvius on its edge. This supervolcano erupted 34,000 and 12,000 years ago.

Here in Victoria we have evidence of supervolcanoes but fortunately way back in the Devonian, some 380 million years ago. Volcanic complexes such as the Dandenongs, Marysville and the Snowy River Volcanics are dotted over the eastern part of our state.

We are grateful to Professor Ray Cas for an informative and well-illustrated talk. The many questions afterwards indicate the degree of interest the presentation created.

Rob Hamson