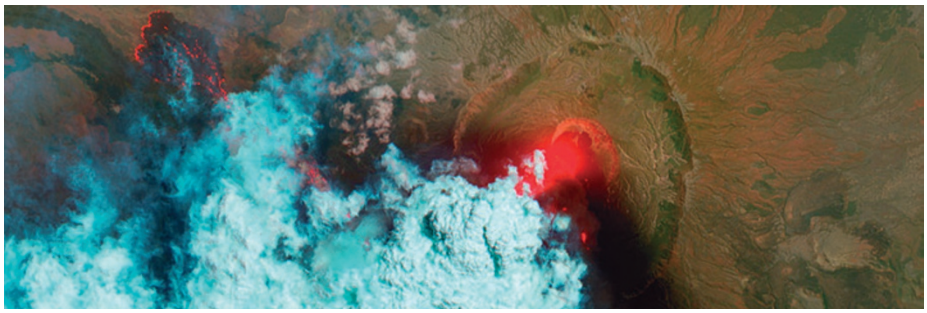
Volcano mix-up

On 12 June 2011, an ash cloud suddenly hovered over the Afar Depression in Eritrea. Hundreds of flights had to be rerouted. The eruption column rose 15 km into the sky above — an exceptionally forceful volcanic eruption. The Volcanic Ash Advisory Centre (VAAC) in Toulouse, France, quickly announced that the Dubbi volcano was source of the thick pall of particulate matter. One day later, the VAAC had to correct its statement: it was actually the nearby Nabro volcano that had erupted. The experts had erred in their attribution of the cloud.

There are reasons for the confusion. Geological monitoring of the Afar region is only sporadic. So the VAAC experts had to rely on satellite observations — but the thick ash cloud obstructed the view. Nabro had been classified as inactive. Its last eruption was thought to date back more than 10,000 years. Yet within just days, the 2,200-m-high desert mountain had become an inferno of lava and red-hot ash. At least seven people were killed in the sparsely populated area. The emissions also tainted water sources and agricultural land.

Geoscientists had just speculated that Afar might be entering a period of inactivity. Between 2005 and 2011, a research team led by Cynthia Ebinger of the University of Rochester and Atalay Ayele of Addis Ababa University in Ethiopia experienced unique upheavals in the Afar Depression. But in early 2011, the magma eruptions and earthquakes had largely ceased.



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Africa is about to break in two. The first rift developed millions of years ago and is filled by the Red Sea and the Gulf of Aden. Now the Earth is opening up along a line reaching south from Eritrea towards Mozambique. In a few million years' time, an ocean will fill this gap.

In the northerly Danakil Depression, the sea could flood in relatively soon. Only some flat hills, no more 25 m high, block the path of the Red Sea's waters. The land beyond has already sunk by dozens of metres and is now well below sea level. A white crust of salt has formed on the sandy soil from earlier incursions by the sea that were then cut off by lava.

No one knows when the sea will flood the desert. Nevertheless, during the past six years, Ebinger, Ayele and their colleagues marvelled at the speed at which the ground can subside. In 2005, a rift in the desert floor opened up over a length of 60 km, some 150 km southwest of Nabro. Since then, during 14 similar events, unusually large eruptions of magma poured into the cracks.

Most of the magma, however, remained below the surface. Masses of magma are eating away the continent from within. The molten rock spreads underground in flat tongues known as dikes. As a result of observations in the Afar region, geoscientists have been able to describe with unprecedented precision how these dikes develop. Measuring the tension in the ground even allows predictions of the spreading direction of the dikes. (*Nature Geosci.* **3,** 713–717; 2010).

Yet magma has also shot up to the surface time and again. In November 2010, the volcano Erta Ale erupted. Now it is Nabro's turn. High levels of volcanic activity are characteristic of the final phase of breakup, before the Earth's crust splits and the formation of deep sea floor begins (*Nature Geosci.* **3,** 248–250; 2011). Africa is breaking up in phases, slow change alternating with periods of powerful magma eruptions that perforate the Earth's crust.

The magma in Afar is often runny and basaltic, of a type usually found near mid-ocean ridges where new sea bed is formed. Initial analyses of satellite images indicate that Nabro is also producing basaltic lava. Nabro's eruption in June is yet another smoke signal from the future sea bed. Only the water is missing. ❐

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The journalist's take

East Africa's geology has fascinated me ever since my time at university. When, in 2005, I read the initial reports by Cynthia Ebinger and colleagues of newly formed cracks in the ground in Afar and associated earthquakes, I followed the group's work more closely. They told me about their latest research on the birth of an ocean in East Africa at the December 2010 Fall Meeting of the American Geophysical Union in San Francisco, and I wrote it up for *Spiegel Online*.

Usually, desert geology or eruptions of African volcanoes never reach the radar of the press: broad interest comes with a degree of familiarity, and very few people in the developed world know enough about the remote African desert to want to read about it. Yet, at *Spiegel Online*, we have run several pieces on geological events in Africa, and with great success. The articles rank among the most-read science stories.

The eruption of the Nabro, even with the no-fly zone thrown in, would not have justified a longer geology article in a broad news portal such as *Spiegel Online* — had it not been for the volcano mix-up. The experts' error provided an interesting twist. Three main elements contributed to the story's success:

- A mega event: the breakup of a continent, witnessed and investigated by geoscientists in Africa.
- Origins: the story touches on the origins of the planet. Geological changes, usually too slow to observe, occur in fast-forward mode in East Africa.
- Expert error: The initial misidentification of the erupting volcano provides an element of surprise — it should be straightforward to attribute a spectacular eruption to the right mountain. The error emphasizes the researchers' humanity.