What Happens If Alaska's Mt. Redoubt Volcano Erupts Soon?

February 9, 2009 Update: *"Unrest at Redoubt Volcano continues, though no eruption has yet occurred. Volcanic tremor and small distinct earthquakes are ongoing. Clear webcam images today showed a steam plume rising up to several hundred feet above the crater throughout the day. AVO continues to watch the volcano 24/7."* - Alaska Volcano Observatory

Above: Mount Redoubt volcano rumbling with seismic activity on January 31, 2009, and releasing steam from a fumerole. **Below:** February 5, 2009, fumeroles on Mt. Redoubt continue to vent steam as first photographed on January 31, 2009, 100 miles southwest of Anchorage, Alaska. Images courtesy USGS.

Fumeroles in the upper Drift Glacier, Mount Redoubt, on February 5, 2009. Image by Cyrus Read, AVO/USGS.

Close-up of fumeroles on January 31, 2009, below the 1989-90 dome. These were the most vigorously steaming fumeroles observed on January 31. Image by Chris Waythomas, AVO/USGS.

February 7, 2009 Reston, Virginia - One hundred miles southwest of Anchorage, Alaska, is a volcano with the name Redoubt, pronounced variously as Mount RE-doubt, or Rih-DOUBT. Redoubt means a strong fortification. The 10,200-foot volcano towers above fishermen in the Cook Inlet. The big mountain looks something like a protective fortress, which probably explains its name.

Mount Redoubt rises 10,200 feet above the Cook Inlet of Alaska, a hundred miles southwest of Anchorage. Image by *Wikipedia.*

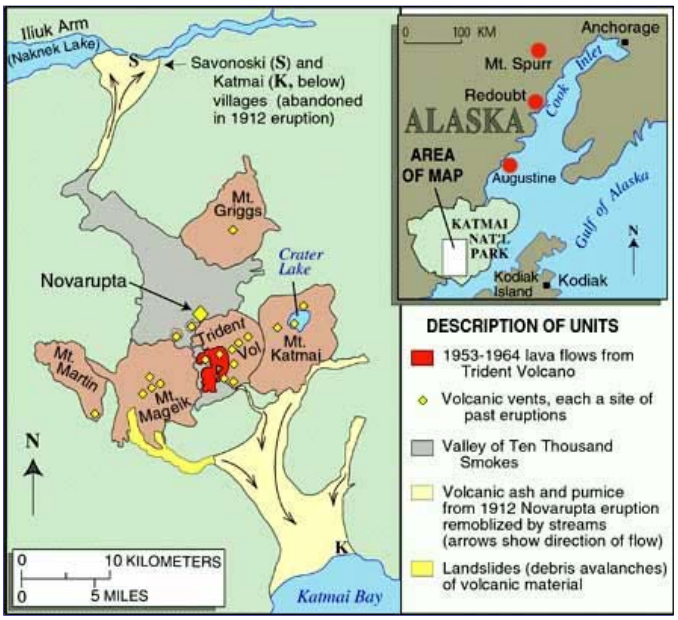
The volcano began venting and rumbling in January 2009, and in the first week of February, its seismic activity has increased so much that the Alaska Volcano Observatory has warned Mount Redoubt could erupt in days or a couple of weeks.

Twenty years ago on December 15, 1989, the Mt. Redoubt volcano erupted with an explosion of gas and ash that rose 40,000 feet and went 150 miles away into the path of a KLM jetliner that carried 231 passengers. The airliner's four engines flamed out. As the crew tried to restart the engines, smoke and strong sulfur smell filled the cockpit and cabin. Then the jet dropped more than two miles before the crew was able to restart all engines and land the plane safely at Anchorage Airport. That plane required $80 million in repairs. Mount Redoubt's 1989 eruption also sent mud flows into the Drift River valley and caused flooding. The volcano kept erupting for five months, until April 1990.

Mount Redoubt, Alaska, volcanic eruption on December 15, 1989, sent gas and ash up 40,000 feet and 150 miles away, interrupting international air traffic. Image by USGS.

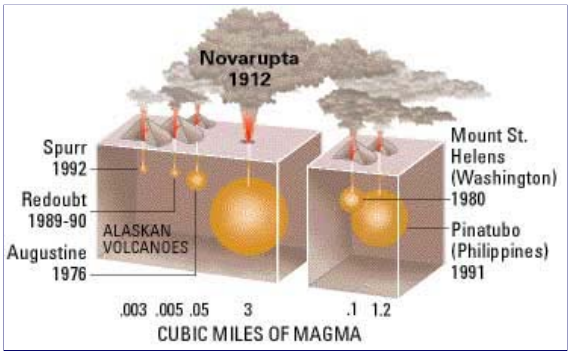
Now at the end of the first week of February 2009, the Alaska Volcano Observatory (AVO) states at its website: "Based on all available monitoring data and knowledge of this volcano, an eruption similar to, or smaller than, the 1989-1990 eruption appears to be the most probable outcome at this time."

What a lot of people don't realize is that Alaska contains over 130 volcanoes which have been active within the last two million years. Of those, more than 50 have been active over the past 250 years and any of those can erupt any time with serious consequences to people and animals.



The biggest volcanic eruption in the 20th century was Mt. Katmai southwest of Mt. Redoubt in 1912, known as the "Novarupta" eruption. Thick ash produced nearly complete darkness for three days and the eruption left a 6-mile-wide caldera (10 kilometers). Graphic courtesy USGS.

Mount Katmai and its 6-mile-wide caldera, now filled with water, that was produced after the Alaskan volcano erupted with 3 cubic miles of magma in 1912. That was 600 times greater than the total erupted material by Mt. Redoubt in 1989 to 1990. Image courtesy USGS.



Comparison of cubic miles of magma spewed from various large volcanoes in the 20th Century. Mount Katmai's Novarupta in 1912 was the largest with 3 cubic miles of magma. That was 30 times greater than the volume of magma released in the 1980 eruption of Mount St. Helens, Washington, which killed 57 people and caused damage that exceeded $1 billion. Even the 1991 eruption of the Philippine's Mount Pinatubo, second largest 20th Century volcanic eruption in the world was less than half the size of Mt. Katmai's Novarupta eruption. Graphic courtesy USGS.

[Editor's Note: *Wikipedia* - "Mount Katmai is a large stratovolcano on the Alaska Peninsula in southern Alaska, located within Katmai National Park and Preserve. It is about 6 miles (10 km) in diameter with a central lake-filled caldera about 3 by 2 mi (4.5 by 3 km) in area, formed during the Novarupta eruption of 1912. Mount Katmai is one of five vents encircling the Novarupta dome, source of the eruption and associated voluminous pyroclastic flows in 1912. The volcano has caused ten known fatalities due to gas exposure."]

The United States Geological Survey monitor's Alaska's volcanoes and the ever-active Yellowstone Park, and all other potentially active volcanic regions of the United States. The USGS Volcano Hazards Program Coordinator is John Eichelberger, Ph.D., in Reston, Virginia. He received his Ph.D. in Geology from Stanford University and worked as Professor of Volcanology at the University of Alaska in Fairbanks for sixteen years. Since Mount Redoubt caused problems with international air traffic in its 1989-1990 eruption, this week I asked Dr. Eichelberger what happens if there are airplanes in the sky over the Cook Inlet when Mount Redoubt erupts again?

Interview:

John Eichelberger, Ph.D., Volcano Hazards Program Coordinator, U. S. Geological Survey, Reston, Virginia: "Well, there will be airplanes in the sky! (laughs) There are over 20,000 people a day that fly in the vicinity of Alaska's volcanoes. That's the main air route between North America and Eastern Asia. But, we will know immediately when Mount Redoubt or any other monitored volcano in Alaska erupts. The aviation industry is now acutely aware of this problem and pay close attention to the warnings that we put out.

WHAT IF MOUNT REDOUBT BLOWS ITS STACK TOMORROW?

The AVO immediately does a call-down to the Federal Aviation Administration, other government agencies and puts out electronic messages as well. The message gets out very

fast to everyone that an eruption is in progress.

DOES USGS GET IN TOUCH WITH THE FAA?

Oh, yes, immediately!

OK, SO RADIO ANNOUNCEMENTS WOULD GO OUT FROM THE FAA TO ANY AIRLINERS IN THE ANCHORAGE OR COOK INLET AREA?

Yes.

THEN WHAT DO THE AIRPLANES DO?

They will divert. The National Weather Service projects where the ash will be going and we provide some guidance on that as well. It depends on how close the planes are to the erupting volcano. If they are very close, they might have to turn around.

FROM YOUR PROFESSIONAL ESTIMATE RIGHT NOW IN FEBRUARY 2009, WOULD YOU GIVE YOUR PERCEPTION ABOUT HOW LIKELY MOUNT REDOUBT IS TO ERUPT THIS MONTH?

It's very likely. We made the statement that an eruption is likely in days to two weeks time frame. In fact, based on the 1989-1990 scenario, we are expecting there would be an eruption by now. It's fairly straightforward to be able to say the volcano has awakened, that molten rock is moving up beneath the thing.

But one of the big problems we have is the false positive. The process can stop at any time and not necessarily after molten rock reaches the surface. So, we are waiting.

Seismic Activity Best Indicator of Impending Volcanic Eruption

IS SEISMIC ACTIVITY THE GREATEST INDICATOR?

It is. Seismic activity is kind of our number one tool because when molten rock is moving at depth, it breaks the solid rock around it and that makes little earthquakes. Also, the gas that is released from the molten rock and the heat that turns underground water into gas flows through cracks and sets up a humming, or tremor signal. So, there are diagnostic techniques.

There are some very tiny earthquakes that we can only detect with instruments right on the volcano, and these are reliable guides to knowing that the volcano is going to erupt very soon.

Another important geophysical measurement that we are gradually putting on volcanoes and we don't have, unfortunately, on Redoubt yet, are very sensitive GPS instruments that can measure swelling of the volcano, which can tell us when molten rock is actually up inside the volcano itself.

WITH THE IMMINENT POSSIBLE ERUPTION RIGHT NOW IN FEBRUARY 2009, WHAT IS THE REASON THAT YOU WOULD NOT HAVE GPS INSTRUMENTS THERE NOW?

(laughs) Not enough money basically. These networks are expensive to install and maintain. There are a lot of volcanoes in Alaska. We have been steadily adding this instrumentation on the most dangerous volcanoes. We have it on Augustine and Spurr, but we don't have them on Mount Redoubt yet.

WHAT IS THE CURRENT SEISMIC ACTIVITY ON MOUNT REDOUBT ON FEBRUARY 4, 2009?

Well, it's perking along! The words are: 'Well above background.' Last weekend (January 30 - 31, 2009) really looked like the start of an eruption, but it wasn't. Right now, it's just sitting there just perking.

Eruption Consequences to Drift River and Cook Inlet

WHAT ARE THE CONSEQUENCES TO THE DRIFT RIVER AND COOK INLET?

Back in the December 1989 to April 1990 Redoubt eruption, there were something like twenty episodes over a period of five months and that's fairly likely to happen again this time. There will be more than a single eruption of ash. There are likely to be a number of eruptions and usually the early ones are the most explosive, but they will likely involve mud flows going down the Drift River valley.

THAT DOES WHAT TO THE RIVER?

Well, it fills it in and those can travel a long way and likely reach Cook Inlet. In the last episode, they inundated an oil storage facility there. Now there are berms built around those tanks and the berms have been strengthened.

BUT FLOODING IS A REAL AND POSSIBLE CONSEQUENCE.

It is, yes.

IF THERE WERE A SERIES OF GAS AND ASH ERUPTIONS FOR FIVE MONTHS, WOULDN'T THAT REALLY HAMPER THE AIR TRAVEL GOING OVER THE POLE?

It depends on how big the explosive events are. It will hamper air travel in the Cook Inlet region and travel between Alaska and the lower 48 states.

WHAT IS THE WORST CASE THAT COULD HAPPEN?

The seismic activity before an eruption is a reasonable indicator of how big an eruption will be. This seismic activity now is on the same scale that occurred before the last eruption episode.

BETWEEN DECEMBER 1989 AND APRIL 1990.

Yes. There is no reason to expect anything bigger than that eruption. Of course, the worst possible case of huge eruptions would be crippling over a huge area. The largest eruption of the 20th Century occurred on the Alaska Peninsula not too far away at Katmai in 1912. "That put a foot of ash on the city of Kodiak, which was 100 miles downwind.

A FULL FOOT OF ASH!

Yes, 100 miles away.

WHAT DID MOUNT ST. HELENS DO AT ITS WORST?

Mt. St. Helens was only about 1/100th of the Katmai eruption in 1912.

SO, IF MOUNT REDOUBT GOES ANYWHERE BETWEEN WHAT IT DID 20 YEARS AGO AND BIGGER, THERE REALLY COULD BE AIRLINE INTERRUPTIONS, POSSIBILITY OF FLOODS AND A LOT OF ASH COVERING A LARGE REGION BETWEEN THE VOLCANO AND ANCHORAGE FOR QUITE A WHILE?

Yeah, but it's highly unlikely that there would be eruption much bigger than what we've seen from Redoubt. That would be a nuisance, a protracted nuisance to air travel.

Worst Case Volcanic Eruption?

GIVEN THE POST-KATRINA AGE WHEN NOTHING OF THAT SIZE WAS EXPECTED EITHER WITH UNEXPECTED CONSEQUENCES STILL ONGOING AND PROBABLY WILL BE FOR A LONG TIME, IT SEEMS LIKE IN THIS NEW ADMINISTRATION THAT IS TRYING SO HARD FOR TRANSPARENCY AND STRAIGHTFORWARDNESS THAT WE ALL OUGHT TO BE TALKING ABOUT WORST CASE INCIDENTS TO GIVE THE PUBLIC A CHANCE TO THINK ABOUT PREPARATIONS THAT MIGHT BE NEEDED IF THERE IS A WORST CASE? WOULD YOU AGREE?

Yes, but the worst cases should be reasonable, otherwise we'll waste a lot of money worrying about things that are very unlikely to happen.

UNDER WHAT CONDITIONS DO YOU THINK THAT THE U. S. GOVERNMENT WOULD HAVE TO SEND IN FEMA AND NATIONAL GUARD?

A repeat of Katmai of 1912 would probably require something like that.

THAT WOULD BE TO DEAL WITH ALL THE ASH AND TO HELP PEOPLE EVEN SEE BECAUSE FOR A WHILE THEY CAN'T SEE IN THE DARK?

Yes, that's right. With Katmai there were three days of almost total darkness.

ARE THERE ANY ONGOING DIALOGUES BETWEEN FEMA AND THE USGS ABOUT YOUR VARIOUS VOLCANO OBSERVATORIES AND WORST CASES AND HOW DOES THE GOVERNMENT GET SOMETHING LIKE FEMA INTO AREAS WHERE THERE MIGHT BE A NEAR-CATASTROPHE FROM A VOLCANO?

Oh, yes, there is, especially post-Katrina, very close cooperation between government agencies. The USGS works a lot with the first responder communities. We go through various eruption scenarios, tabletop exercises. We will be doing something like that, some kind of ash fall exercise, for the Anchorage region this spring.

SO NO MATTER WHAT MOUNT REDOUBT DOES, YOU ALL HAVE BEEN PREPARING TO COME IN AND WORK IN CLOSE QUARTERS WITH THE FIRST RESPONDERS CLOSE HAND AND WITH THE FEDERAL GOVERNMENT?

Yes, those preparations are going on all the time.

Yellowstone Park - What If It Blows This Century?

The Yellowstone volcano's huge caldera is outlined in red. The rising bulge is under the northern rim of the caldera at the Sour Creek Dome near Canyon.

WHAT IS THE LIKELIHOOD THAT YELLOWSTONE COULD EXPLODE IN OUR LIFETIME LIKE IT DID 640,000 YEARS AGO?

Yellowstone is the biggest of these things and has been popularized as a super volcano. But there are many other calderas, huge craters, and a number of them are in Alaska. Katmai is the smallest. Another, Aniakchak, which formed 3,400 years ago and Okmok, which formed 2,000 years ago – those things are 10 kilometers (6 miles) in diameter.

I think we should be thinking about not such colossal eruptions, but what would happen if there were a Katmai-sized eruption.

IN YELLOWSTONE.

Or anywhere in the world because those things are so big they would affect the food supply.

IF IT DID HAPPEN IN YELLOWSTONE PARK AT THAT SIZE, WHAT WOULD THE CONSEQUENCES BE?

Catastrophic.

CATASTROPHIC TO ANIMALS AND PEOPLE?

Oh, yes.

WHAT ARE WE TALKING ABOUT? KATRINA-DEATH-NUMBERS OR GREATER?

Far more because that super eruptions killed animals a thousand miles away.

IN THE LAST 150 YEARS, THERE HAVE BEEN AT LEAST TWO OR THREE EXTREMELY LARGE VOLCANIC ERUPTIONS AND WHAT YOU JUST SAID, IF WE

HAD JUST ONE OF THOSE SIZES AT YELLOWSTONE, IT COULD KILL ANIMALS WITHIN A THOUSAND MILES AND THAT MEANS IT COULD KILL HUMAN BEINGS WITHIN A THOUSAND MILES.

Oh, yes, certainly. They have been events much smaller than the major Yellowstone events, but much larger than anything that could possibly come out of Mount Redoubt.

BUT BACK TO YELLOWSTONE, WHAT KIND OF MEASURING DEVICES DO YOU HAVE THERE THAT IS SENDING INFORMATION TO USGS ALL THE TIME AND HOW MUCH WARNING MIGHT THERE BE TO MOVE OUT A THOUSAND MILES OF POPULATION BEFORE SOMETHING BLEW?

Well, that's a good question. The largest eruption that we've had in more modern times where there were monitoring instruments in place was Pinatubo, Philippines in 1991. That was smaller than Katmai in Alaska, but probably ten times bigger than anything that Redoubt could do.

IF YELLOWSTONE WERE THE SIZE OF PINATUBO?

We would probably see a few months run up of seismic activity to pretty good sized earthquakes.

ABOVE 4? OR 5?

Maybe above Richter 6. I'm speculating here. The Katmai eruption in 1912, people were just starting to use seismographs. And so, we actually know something about the magnitude of those earthquakes. There were about four that were a magnitude 6 associated with the Katmai, Alaska, eruption. So, we would see that kind of thing in Yellowstone.

Now, a complication is that these giant systems, such as Yellowstone – Mount Redoubt is really a pretty small volcanic system. But the gigantic ones like Yellowstone seem to be able to go through much stronger episodes of restlessness without doing any erupting. They are much more difficult to do any kind of forecasting.

Yellowstone Park Caldera Has Risen 3 Inches Per Year Since 2004

BUT, AS I UNDERSTAND IT, THE UPWARD MOVEMENT OF THE YELLOWSTONE CALDERA FLOOR HAS BEEN ALMOST THREE INCHES, WHICH IS SEVEN CENTIMETERS, PER YEAR SINCE 2004.

Yeah, that's pretty amazing. Now, if Mount Redoubt were doing that, we would be very, very worried.

WHY AREN'T WE WORRIED THEN THAT YELLOWSTONE COULD BE GETTING READY TO DO SOME MONUMENTAL BLOWING UP? THAT RISE OF THREE INCHES PER YEAR SINCE 2004 IS THREE TIMES GREATER THAN EVER OBSERVED SINCE SUCH MEASUREMENTS BEGAN IN 1923.

Yeah, but Yellowstone has been doing something almost continuously since we have been able to measure movements precisely and we know from experience all over the world that these kinds of systems go up and down all the time, but don't erupt.

SO, WHEN IT COMES TO YELLOWSTONE, IN SPITE OF THE BULGE WHICH PROBABLY IMPLIES THERE IS MAGMA RISING SOMEWHERE DOWN THERE,

Yes.

WE KNOW THAT EVERYTHING ON THE SURFACE IS PRETTY HOT. ARE YOU SAYING THAT THE ONLY DEFINITIVE MEASUREMENT THAT USGS WOULD HAVE FOR WARNING WOULD BE SEISMIC ACTIVITY IN YELLOWSTONE AT 6. AND ABOVE ON THE RICHTER SCALE?

We look at all kinds of data. By satellite, surface motion. Seismic activity. Gas output – if we saw a big increase in the release of sulfur dioxide – that's an indication of magma moving up towards the surface.

WOULD SUCH AN INCREASED SULFUR DIOXIDE RELEASE NORMALLY BE LINKED TO 6. AND ABOVE ON THE RICHTER SCALE SEISMIC EVENTS?

Yes, but the bottom line is that at Yellowstone so far, we haven't had a patient with that

kind of disease. (laughs) So, we're just speculating here. Keep in mind that Yellowstone has not had a volcanic eruption in about 70,000 years. And the kinds of events we should worry about as a society are things that happen once a century. We sometimes worry about things that might happen once a millennium. We generally don't worry about things that are less like to happen than that.

> [Editor's Note: USGS source: "Three extremely large explosive eruptions have occurred at Yellowstone in the past 2.1 million years with a recurrence interval of about 600,000 to 800,000 years. More frequent eruptions of basalt and rhyolite lava flows have occurred before and after the large caldera-forming events. For example, scientists have identified at least 27 different rhyolite lava flows that erupted after the most recent caldera eruptions, about 640,000 years ago, from vents inside the caldera. The most recent was about 70,000 years ago. Many of these eruptions were separated in time by several tens of thousands of years. Because the evidence of earlier eruptions may have been either buried or destroyed, we do not really know how often the volcano has actually erupted.
>
> The most recent volcanic activity consisted of rhyolitic lava flows that erupted approximately 70,000 years ago. The largest of these flows formed the Pitchstone Plateau in southwestern Yellowstone National Park.
>
> Since the most recent giant caldera-forming eruption, 640,000 years ago, approximately 80 relatively nonexplosive eruptions have occurred. Of these eruptions, at least 27 were rhyolite lava flows in the caldera, 13 were rhyolite lava flows outside the caldera and 40 were basalt vents outside the caldera. Some of the eruptions were approximately the size of the devastating 1991 Pinatubo eruption in the Philippines, and several were much larger. The most recent volcanic eruption at Yellowstone, a lava flow on the Pitchstone Plateau, occurred 70,000 years ago."]

BUT THE ONCE-PER-CENTURY VOLCANIC ERUPTIONS CAN CERTAINLY INTERRUPT CURRENT DAY AIRLINE TRAVEL, LARGE POPULATIONS AND BLOCK UP RIVERS SO THEY FLOOD.

Oh, absolutely! Yes, a once-in-a-century eruption is definitely worth worrying about.

AND MOUNT REDOUBT MIGHT BE IN THAT CATEGORY?

More likely a once-in-a-decade event.

EITHER WAY, IT'S GOING TO CAUSE PROBLEMS WHEN IT BLOWS?

It will, yes. But because there will be rapid warning, because the airline industry is acutely aware of this problem, it's highly unlikely there will be any deaths or injuries from this next eruption.

Alaska's Long Volcanic History

SO, THAT PART OF THE UNITED STATES WAS ACTIVE AND ERUPTING MAGMA AND ASH AND GAS ONLY 2,000 AND 3,000 YEARS AGO.

Oh, yeah! It's not because activity has decreased. It's just that geologically, those kinds of volcanic events are spaced out every few hundred to a thousand years.

One of them had a big eruption last summer of 2008 – Okmok. It built a new mountain inside the giant crater. And that did interfere with trans-Pacific air travel.

FOR HOW LONG?

A short period of time.

AGAIN, THE USGS IS RELYING MORE ON SEISMIC ACTIVITY TO GIVE THE ALERT THAN JUST ABOUT ANY OTHER SYMPTOM?

That's the first line of defense, but we look at these things very carefully. We have a regular program schedule of satellite surveillance of all these volcanoes and on some of the most active such as Okmok, we have GPS instruments that can detect swelling of the volcano.

DO YOU THINK WITH THE RE-ACTIVATION OF MOUNT REDOUBT IN 2009 THAT

IT MIGHT PROVOKE MORE MONEY FROM CONGRESS TO AUTHORIZE MORE MONEY FOR GPS INSTRUMENTS ON THAT VOLCANO?

Yes, it's definitely part of the dialogue.

IF YOU WERE BETTING ON WHETHER YOU WERE GOING TO GET YOUR MONEY OR NOT, WHAT WOULD YOU SAY?

(laughs) I am not a betting man. I am always a hopeful one, though."

2009 began with a volcanic eruption on January 3, at the Kilauea Volcano in Hawaii. Five days later on January 8, a 6.2 magnitude earthquake struck near the Poas volcano in Costa Rica, destroying 423 houses, killing twenty-three people and injuring another hundred in a mudslide. The earthquake set off fears that the Poas volcano was getting ready to erupt again.

In 2008, eighty-four volcanoes either erupted or were restless on our planet Earth. Two of the most explosive 2008 eruptions occurred at volcanoes that were not even monitored by USGS – the Chaiten Volcano in Chile that had not erupted in more than 9,000 years and Kasatochi in Alaska that had not erupted in more than a century.

There is always the medical worry that people and animals will breathe in volcanic ash that can damage lungs. So, the Centers for Disease Control and Prevention in Atlanta, Georgia, has issued an alert to people living in the Anchorage and Cook Inlet region of Alaska where Mount Redoubt could blow any day now.

CDC: "To avoid lung damage, get an N95 disposable respirator mask - also known as an air purifying respirator mask. N95 respirators can be purchased at hardware stores. Respirators range from disposable models that look similar to some face masks to the cartridge-type respirators that are generally referred to as gas masks. The Guidance specifically refers to the disposable filtering facepiece type of respirator, with a NIOSH rating of N95 or greater. These are also called particulate respirators. N95 is stamped on them."

Center for Disease Control and Prevention
Examples of N95 Disposable Respirators

http://www.cdc.gov/Features/MasksRespirators/examples.html

This is one N95 respirator style.
Photo courtesy of Kimberly-Clark.

This is another style N95 respirator.
Photo courtesy of Moldex.

More Information:

For further information about Earth volcanoes and other planet-changing events, please see reports below in the **Earthfiles Archive**:

- 05/13/2006 — Mt. Merapi Volcano In Ring of Fire

• 01/03/2006 — Antarctic Earthquakes and Edgar Cayce Pole Shift Prediction
• 12/09/2005 — Mystery of "Footprints" in 1.3 Million-Year-Old Mexico Volcanic Rock
• 11/18/2005 — Is the Sun Heating Up?
• 05/07/2005 — Did Milky Way Gas and Dust Turn Earth Into Icy Snowball Four Times?
• 04/01/2005 — What's Killing Off Marine Life Every 62 Million Years?
• 03/20/2005 — Astronaut John Young: "The Moon Can Save Earth's Civilization."
• 03/10/2005 — Juan de Fuca Ridge: 4,000 Small Quakes West of Vancouver Island, Feb. 27 - Mar. 4.
• 09/27/2004 — Earthquake Swarms At Mt. St. Helens, Washington
• 07/23/2004 — Earth's Weakening Magnetic Field - Signal of Pole Reversal?
• 02/27/2004 — Abrupt Climate Change: Scenario from A Pentagon-Commissioned Report
• 12/13/2003 — Yellowstone Is Still An Active Volcano
• 09/19/2003 — Yellowstone Park - Will There Be Another "Super Volcano?"
• 08/30/2003 — Volcanic and Seismic Threats to Northwest U. S.

Websites:

Alaska Volcano Observatory (AVO): **http://www.avo.alaska.edu/volcanoes/**

Yellowstone Volcano Observatory: **http://volcanoes.usgs.gov/yvo/**

CDC N95 Respirators: **http://www.cdc.gov/Features/MasksRespirators/examples.html**

Mount Katmai: **http://en.wikipedia.org/wiki/Mount_Katmai**

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