

zephyrs. They will be very fierce and will rage across the world.

However, even this is not the crucial point in this question of release of latent heat. The crux is this: though the heat of the strike will in the end radiate back to space, radiation under constant cloud cover at biological temperatures is a fairly slow business. The following cycle will continue for some time before all the excess heat leaks off the Earth:

Heat absorbed by evaporation

Condensation

Release of latent heat for further evaporation

Long range weather forecast: Very wet, very windy, very cloudy. Period of forecast indefinite.

As if this were insufficient, another factor comes into play to reinforce the overall effect of the heat cycle: let me explain it.

In the year 1883, the volcano Krakatoa blew its top. I will refer again to this event in another connection, to make another standard comparison.

"Blew its top" is an all too literal statement. The detonation pulverized several cubic miles of the volcanic cone. Where this originally peaked at a 3,000 foot summit, the ocean now rolls over part of the base. The explosion was a mere volcanic incident—two or three megatons of TNT would do as much; the energy released was only 7×10^{22} ergs.

A respectable proportion of the rock was shattered so finely that it hung twenty miles high in the stratosphere throughout the following decade. Doubtless some of it is still there.

There were noticeable effects. For the next ten years, sunsets and dawns were gaudier than usual the whole world over. It is said that over the same period, worldwide temperatures were very slightly lower than average.

Our model strike carries nearly six million times the energy released by Krakatoa.

The amount of solids thrown up by the meteorite will not be in the same ratio. They may, in fact, only be five or six thousand times as much as the pulverized volcanic cone. At first sight, the ratio of solids displaced may be thought

to settle the amount of dust which is raised. This, however, is not the case. What will count is the minuteness with which the material is divided. A ridiculously small quantity of finely divided titanium oxide set free from naval smoke-floats will screen a naval task force from view.

Here the very high brisance of the meteorite explosion comes into play. Even a Barringer-size strike leaves rock-flour on the crater floor. Much of what is blasted out must be finer still. (Did you see the picture of the cloud of lunar dust raised by Lunik V?)

The fact that the strike is on the seabed will make little difference. Superheated steam blasts just as forcibly as other explosion gases. The steam jet cutting up to the ionosphere will scavenge all powder from the crater, and a great deal of ooze on the ocean bed miles from the crater will go up with it. Clearance will be more effective than in the case of the land-strike. Salt will be carried up by the steam jet, and will float as fine crystals on high. These will be joined by salt crystals which are residue of the sea water splashed across the heavens in bulk. There will also be a large contribution from microscopic particles of rock and metal which sublime from volatilized material. Even on the very moderate assumption that, erg for erg, Vredevoort II lifts only one per cent of the microscopic particles raised by Krakatoa, it will still throw up sixty thousand times as much fine powder.

Let's hack out an answer: Take a conservative ration of 100 cubic kilometers of rock powder, sublimed micro-droplets salt, and seabed ooze. Choose particles only a micron in size, or grind them down to size by blast or steam jet. Use multi-megaton blasts and steam jets and winds of tornado strength to scatter them across the stratosphere. The resultant haze teams up 200 particles thick over the entire surface. Every electron on the ground has 200 particles directly overhead. The aggregate thickness of the screen will only be a fifth of a millimeter: but did you ever read fine print through even one hundredth of an inch of granite?

As a result of the impact a persistent and effective dust cloud will veil the stratosphere. It will float there for a period in no wise shorter than the decade after Krakatoa. The Earth's albedo will be effectively increased. A perceptible decrease in the solar heat reaching the surface for at least ten