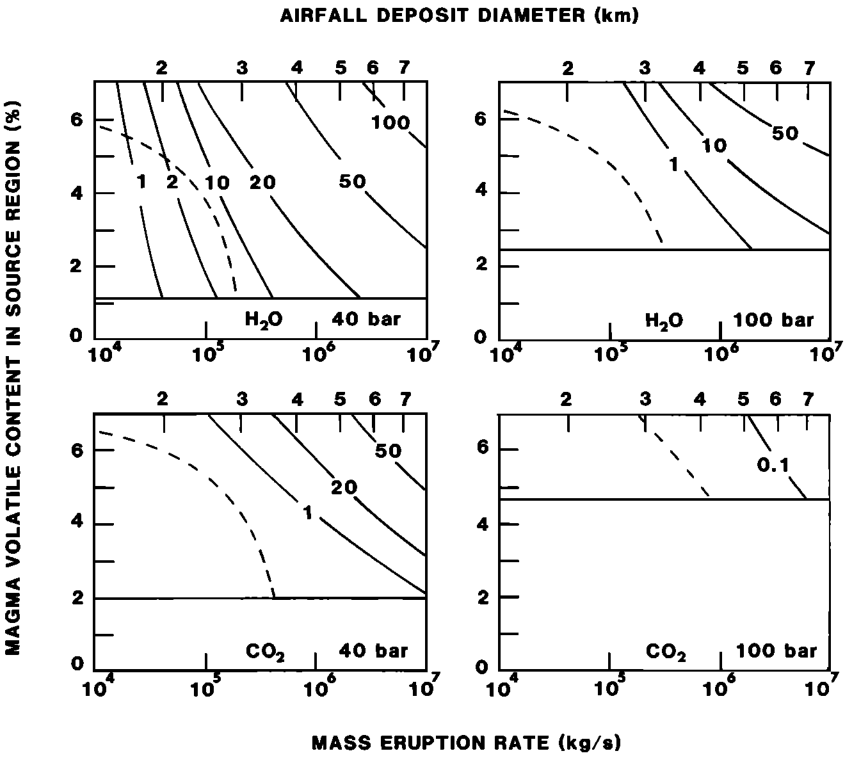

Fig. 9. The sizes of pyroclastic deposits produced by ejecta from Hawaiian fire fountains on Venus, shown as a function of magma volatile content (left-hand axes labeled in weight percent) and mass eruption rate of magma (lower axes labeled in kilograms per second). The horizontal line in each diagram shows the minimum volatile content for which explosive activity of this type can occur for the stated combination of volatile composition and planetary surface pressure. The solid contours show the ranges of ballistic ejecta and are labeled in meters; however, ballistic ejecta are only likely to dominate the deposits for combinations of eruption conditions to the left of the dashed line in each diagram. For all other conditions most of the ejecta will be entrained into convecting eruption clouds, and for these cases the upper axes show the diameters (in kilometers) of the resulting air fall deposits.

ranges of the clasts which follow ballistic trajectories. Second, the range of conditions (mass fluxes and volatile contents) under which fire fountains can form at all is much smaller than on Earth; the density of the magmatic gas is so high on Venus even after it has decompressed to the local atmospheric pressure that it is capable of sweeping much coarser clasts into a convecting eruption cloud than would be possible at similar eruption speeds on Earth. Eruption speeds are, in fact, smaller on Venus than on Earth for the same magma volatile content just because of the reduced amount of gas expansion, but the higher gas density much more than compensates for this factor. As a consequence of the combination of these two effects, the maximum distances from the vent which can be reached by clasts which form fire fountains are calculated to be extremely small, nominally only a few meters in all cases. No doubt there will be enough irregularities in the walls of real vent systems to produce a greater spread of pyroclast launch angles than is implied by the idealized calculations, but it is nonetheless regarded as likely that ballistic pyroclasts will land within at most one vent radius of the edge of the vent. When the implied eruption parameters are inserted into the equations given by Wilson and Head [1981] for the opacity (and hence heat retention capability)of fire fountains, it is found that in all cases where a fountain can form on Venus, the magma clots within it will suffer negligible cooling during flight and will coalesce on landing to form a lava flow or a pond around a vent.

4.8. Plinian Eruptions

We saw in the previous section that explosive eruptions of basaltic magmas on Venus at mass eruption rates greater than about 3 x 10^5 kg/s (and at lower mass fluxes if the magma gas content is very high) will inevitably lead to conditions in which most or all of the pyroclasts produced are entrained into a convecting eruption cloud. The same will be true of eruptions of silicic magmas on Venus (assuming these occur) since, as is the case on Earth, the high viscosity of silicic melts reduces the opportunities for gas bubble coalescence and increases the likelihood of thorough magma disruption [Sparks, 1978]. Progressively higher eruption clouds will be produced at progressively higher mass eruption rates, as indicated by equation (29), and the air fall deposits from these clouds will form the Venusian equiva-