**Answers to Exercises**

**Chapter 8**

**Exercise 8.1**

The rise height of the eruption column is given by Eq. (8.2):

*H* = 5 *B*1/4 *N*-3/4 .

Combining Eqs. (8.3) and (8.4), and rearranging yields and expression for buoyancy flux:

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Taking *Q* = 106 kg s-1, N = 0.01 s-1, *g* = 9.81 m s-2, *To*= 1173 K, *Ta* = 288 K, and *ra* = 1.25 kg m-3, gives *B =* 2.4 × 107m4 s-3*.* The rise height of the column is therefore ~11 km.

If grain size increases, thermal contact with the gas phase decreases, and so column height also decreases.

**Exercise 8.2**

Rearranging Eq. (8.2) for *B*:

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so that, with *H* = 2500 m and *N* = 0.01 s-1*, B* = 6.25 × 104 m4 s-3.

Combining Eqs. (8.3) and (8.4) and solving for *Q*:

* .*

This time the eruption temperature *To* is that of basalt, i.e., ~1273 K, and using the same atmospheric parameters as Exercise 8.1, the mass eruption rate *Q* for the plume only is ~2.1 × 103 kg s-1. Given that only 10% of the erupting mass is going into the ash plume (i.e., the remaining 90% is in the coarse fountain), the total mass flux for each fountain is (2.1 × 103)/0.1 = 2.1 × 104 kg s-1.