Additional Exercises
Chapter 7

Exercise 7.3

Using ballistic data from Waitt *et al.* (1995) (size and distance, Table 7.3), calculate corresponding initial launch velocities required for the population to reach their final locations using Eject! (Mastin, 2001; http://vulcan.wr.usgs.gov/Projects/Mastin). Assume spherical clasts, a 45˚ launch angle, 2500 kg m^{-3} ballistic clast density, and no ambient wind.

(a) Compare results for a constant $C_d = 0.5$ vs. $C_d = 0.1$, using a reduced drag zone of 25 m.

(b) Compare results for a reduced drag zone of 25 m vs. 50 m, using a constant C_d of 0.5.

(c) Compare solutions to those presented in Fagents and Wilson (1993). Assume a 45˚ launch angle, 2500 kg m^{-3} ballistic clast density, and a 0.05 gas/solid mass ratio. Comment on the differences in velocity.

Table 7.3. Data for ballistic blocks ejected from a vulcanian eruption at St. Augustine volcano, USA (Waitt *et al.*, 1995). Note: summit height is 1952 m above sea level.

Horizontal range (m)	Altitude of landing site (m)	Block diameter (m)
2700	976	0.37
2700	968	0.09
2950	930	0.5
3400	857	0.17

Exercise 7.4

View the video of the vulcanian eruption of Santiaguito volcano, Guatemala. The video was analyzed for flow-front velocity vs. height and time (see Table 7.4).

(a) Plot the data in order to classify the eruption. What source conditions controlled the dynamics of the eruption (momentum or buoyancy or both)?

(b) Does the eruption morphology (or evolution thereof) tell you anything about the source (vent) conditions?

Table 7.4 Santiaguito eruption data

Height (m)	Velocity (m s^{-1})	Time (s)
0	0	0
700	52.49738	22.167
1058.75	53.80981	28.834
1636.25	33.55137	46.568
2030	44.24157	55.468
2467.5	32.89474	68.768
3447.5	30.98242	95.401
3902.5	25.60928	113.168
4357.5	25.65838	130.901
4725	18.40537	150.868
5162.5	24.6243	168.635
5740	21.34725	201.902