**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.

* 1. Compare results for a constant *Cd* = 0.5 vs. *Cd*= 0.1, using a reduced drag zone of 25 m.
  2. Compare results for a reduced drag zone of 25 m vs. 50 m, using a constant *Cd* of 0.5.
  3. Compare solutions to those presented in [Fagents and Wilson (1993)](OS_FagentsandWilson_1993.pdf). 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](OS_Santiaguitovulcanian.wmv) of the vulcanian eruption of Santiaguito volcano, Guatemala. The video was analyzed for flow-front velocity vs. height and time (see Table 7.4).

1. Plot the data in order to classify the eruption. What source conditions controlled the dynamics of the eruption (momentum or buoyancy or both)?
2. 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 |