Firebrand flux

186 m

0 m

320 m

FBP X

FBP Y

FBP Z

FCS X

FCS Y

FCS Z

Fire line

Road

320 m

160 m

300 m

250 m

150 m

100 m

50 m

Note:

42 types of firebrands including cylindrical, cubic and spherical shapes.

Input total number of firebrands = **7223 pcs/s**

Changes:

Increasing input number of particles up to **2 x 7223 pcs/s**

Increasing wind velocity by adding particles in put velocity at the fire line.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Location | Firebrand density (pcs/m2) | | | difference | Flux (pcs/m2.s) | | | difference |
| **Exp** | **7223 pcs** | **2 x 7223 pcs** | **Exp** | **7223 pcs** | **2 x 7223 pcs** |
| FCS X | 335 | 18.5 | 40.6 | 54% | 0.824 | 0.035 | 0.076 | 54% |
| FCS Y | 463 | 168.7 | 433.7 | 61% | 0.902 | 0.364 | 0.937 | 61% |
| FCS Z | 536 | 386.5 | 1014.2 | 62% | 1.361 | 1.154 | 3.027 | 62% |

Changes:

1. Increased the wind velocity up to the upper limit (4.4 m/s) given in the experiment.

Reason: Bigger firebrands are not moving on to the collection plots under the average wind field.

1. Varied the input rates of firebrands to get closer to the experiment results.

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| --- | --- |
| Trail | Total input number (pcs/s) |
| TR1 | 14 446 |
| TR2 | 10203 |
| TR3 | 9880 |

Firebrands landing time span in experiment

FCS X 335 s

FCS Y 463 s

FCS Z 536 s

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Firebrand density (pcs/m2)** | | | | **Diff%** | **Flux (pcs/m2. s)** | | | | **Diff%** |
| Exp | **TR1** | **TR2** | **TR3** | **Exp** | **TR1** | **TR2** | **TR3** |
| FCS X | 335 | 40.6 | 239 | 260 | 22% | 0.824 | 0.076 | 0.714 | 0.776 | 5.8% |
| FCS Y | 463 | 433.7 | 433 | 478 | -3% | 0.902 | 0.937 | 0.935 | 0.931 | -3.2% |
| FCS Z | 536 | 1014.2 | 878 | 738 | -38% | 1.361 | 3.027 | 1.638 | 1.377 | -1.2% |

Comparison with the experiment

1. Firebrand density (pcs/m2)
2. Firebrand flux (pcs/m2.s)
3. Area of firebrands’ distribution of each X, Y, Z locations.
4. Temperature data of X, Y, Z locations in different elevations when the fire line is at certain distance.

Other

1. Wind velocity at wind station.
2. Wind condition at the burning plots (3 m height)
3. Heat flux data of burning plots.

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| --- | --- | --- | --- | --- | --- | --- |
| Index | Shape | Area (m2) | Size class (x10-5) m2 | Input rate pcs/s | | |
| TR1 | TR2 | TR3 |
| 1 | cylindrical | 2.57E-05 | 0.75 -5 | 327 | 1391 | 1391 |
| 2 | cylindrical | 2.73E-05 | 0.75 -5 | 327 | 200 | 200 |
| 3 | cylindrical | 2.13E-05 | 0.75 -5 | 327 | 696 | 696 |
| 4 | cylindrical | 2.57E-05 | 0.75 -5 | 327 | 139 | 139 |
| 5 | cylindrical | 7.26E-04 | >50 | 45 | 400 | 400 |
| 6 | cylindrical | 1.30E-04 | 10-20 | 67 | 15 | 15 |
| 7 | cylindrical | 9.11E-05 | 5-10 | 77 | 15 | 15 |
| 8 | cylindrical | 1.16E-04 | 10-20 | 67 | 15 | 15 |
| 9 | cylindrical | 1.15E-04 | 10-20 | 67 | 15 | 15 |
| 10 | cylindrical | 7.37E-05 | 5-10 | 77 | 21 | 21 |
| 11 | cylindrical | 6.76E-05 | 5-10 | 77 | 22 | 22 |
| 12 | cylindrical | 3.69E-05 | 0.75 -5 | 327 | 22 | 22 |
| 13 | cylindrical | 1.69E-04 | 10-20 | 67 | 21 | 21 |
| 14 | cylindrical | 1.81E-04 | 10-20 | 67 | 10 | 10 |
| 15 | cylindrical | 6.69E-05 | 5-10 | 77 | 10 | 10 |
| 16 | cylindrical | 3.75E-05 | 0.75 -5 | 327 | 21 | 21 |
| 17 | cylindrical | 8.55E-05 | 5-10 | 77 | 22 | 22 |
| 18 | cylindrical | 3.36E-05 | 0.75 -5 | 327 | 10 | 10 |
| 19 | cylindrical | 2.29E-05 | 0.75 -5 | 327 | 21 | 21 |
|  |  |  |  |  |  |  |
| 20 | cubic | 2.49E-05 | 0.75 -5 | 327 | 22 | 22 |
| 21 | cubic | 2.71E-05 | 0.75 -5 | 327 | 40 | 4 |
| 22 | cubic | 3.19E-05 | 0.75 -5 | 327 | 21 | 21 |
| 23 | cubic | 2.29E-05 | 0.75 -5 | 327 | 14 | 14 |
| 24 | cubic | 4.36E-04 | 30-50 | 27 | 6399 | 6399 |
| 25 | cubic | 3.04E-04 | 30-50 | 27 | 15 | 7.5 |
| 26 | cubic | 2.66E-04 | 20-30 | 42 | 21 | 2.1 |
| 27 | cubic | 2.68E-04 | 20-30 | 42 | 9 | 9 |
| 28 | cubic | 8.34E-05 | 5-10 | 77 | 9 | 9 |
| 29 | cubic | 8.39E-05 | 5-10 | 77 | 4 | 40 |
| 30 | cubic | 1.39E-04 | 10-20 | 67 | 139 | 13.9 |
| 31 | cubic | 8.18E-05 | 5-10 | 77 | 139 | 13.9 |
| 32 | cubic | 4.96E-05 | 0.75 -5 | 327 | 139 | 139 |
| 33 | cubic | 5.25E-05 | 5-10 | 77 | 40 | 40 |
| 34 | cubic | 4.29E-05 | 0.75 -5 | 327 | 15 | 15 |
|  |  |  |  |  |  |  |
| 35 | spherical | 2.92E-05 | 0.75 -5 | 327 | 21 | 21 |
| 36 | spherical | 2.12E-05 | 0.75 -5 | 327 | 21 | 21 |
| 37 | spherical | 2.64E-05 | 0.75 -5 | 327 | 22 | 0.44 |
| 38 | spherical | 7.70E-05 | 5-10 | 77 | 9 | 9 |
| 39 | spherical | 1.58E-04 | 10-20 | 67 | 10 | 1 |
| 40 | spherical | 7.39E-05 | 5-10 | 77 | 10 | 10 |
| 41 | spherical | 6.79E-05 | 5-10 | 77 | 9 | 0.9 |
| 42 | spherical | 5.67E-05 | 5-10 | 77 | 9 | 0.9 |

Supportive data:

How the inlet velocity was set?

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