**Analysis: Yu Model**

**Method of running model**

1. Read in Van Melkebeke dataset.
2. Calculate additional required variables:
   1. Surface area of equivalent sphere
   2. mP surface area
   3. Equivalent spherical volume
   4. mP mass
   5. Corey Shape factor
   6. Relative density
   7. Projected area of volume equivalent sphere
3. For each particle:
   1. Calculate the dimensionless particle size
   2. Calculate the drag coefficient for spherical particles
   3. Calculate the drag coefficient
   4. Calculate the terminal settling velocity
4. For each output file:
   1. Calculate the average error:
   2. Calculate the root mean squared error:

**Results and discussion**

Chart, scatter chart

Description automatically generated

Chart, scatter chart

Description automatically generated

Considering all the datapoints, the model is fairly accuate in estimating the terminal settling velocity of all the particles.

Chart, scatter chart

Description automatically generated

Considering only the mPs with fragment morphology, the model provides a close estimate of the settling velocity of all fragments.

Chart, scatter chart

Description automatically generated

Considering only the fibrous mPs, the model slightly overestimates the settling velocity of the mPs.

Chart, scatter chart

Description automatically generated

Considering only the films, the model closely estimates the terminal settling velocity of film mPs.

Chart, scatter chart

Description automatically generated

The particle terminal settling velocity increases as particle size increases. The fragments have the largest equivalent spherical diameter.

Diagram, scatter chart

Description automatically generated with medium confidence

The fragment mPs have the highest CSF.

Summary table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Shape** | **m** | **R2** | **AE (%)** | **RMSE (%)** |
| All | 1.0849 | 0.9611 | 14.81 | 2.27 |
| Fragment | 1.0780 | 0.9626 | 11.55 | 1.49 |
| Fibre | 1.2714 | 0.4694 | 33.18 | 4.32 |
| Film | 0.9452 | 0.7091 | 12.14 | 2.04 |

Based on the values of m, the model predicts the settling velocity of films most accurately. The average error is lowest for fragments and highest for fibres. Overall, the model provides a close estimate of the settling velocity in Van Melkebekes dataset.

**Conclusion**

* Model performs best for fragments and films.
* Model predictions are quite accurate with low errors.