

UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

THE MAXIMUM HORIZONTAL LENGTH OF
BALLISTIC PROJECTILE DURING
VOLCANIC ERUPTION

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ABSTRACT

Nowadays, the eruption of the active volcanoes give a big impact to the resident around it. The residents around the volcanoes should know the maximum horizontal length of magma that will flow to avoid any casualties. This project are entirely on calculating the maximum horizontal length of the magma ejected during the eruption based on the types of volcano. This project specified on the special cases which is air drag (C_d) is equal to zero. It consider the spherical shape of the tephra that been burst out from the vent.

The derivation started with the Volcanic Ballistic Projectile (VBP). VBP acting by the two forces namely gravitational attraction and drag against the climatic air. Next, one of the subsection from Vector Calculus which is Motion In Space (Velocity and Acceleration) being used. Newton's Second Law of Motion, $F = ma$ is applied after the special cases.

By considering the type of volcanoes, a result give a different range of maximum horizontal of the magma flowed. This is because of some factors affecting the surface of volcanoes which is the viscosity of the magma flowed. The low viscosity of the magma permits the magma should venture out down incline causing the least horizontal length of magma travel.

1 INTRODUCTION

Generally, this project discussing on the maximum horizontal length of ballistic projectile during volcanic eruption. A volcano is vent or 'chimney' that connect magma from within the Earth's crust to the Earth's surface. The liquid rock is called magma when it is under the Earth's surface and lava after it comes out from a volcano. There are also volcanoes found in ocean floor or even under the icecaps in Ireland instead of common volcanoes. Common volcanic gases include water vapor, carbon dioxide, sulfur dioxide, hydrogen chloride, hydrogen fluoride and hydrogen sulfide.

There are a few of hazardous volcanic effects such as pyroclastic flows, pyroclastic surges, lava flows, ash falls, lahars (mudflow), volcanic gases, lateral blasts, debris avalanches, lightning strikes, tsunamis, and ballistic projectile. Sulphur acid and other gases as well as particle are strongly contain in the volcanoes and some of them will give bad effects to human and environment.

According to Jumadi & Quincey (2015), the volcano eruption commonly difficult to predict accurately in terms of when the events come, how big the explosion and magnitude, and to whom it will be exposed. Section inside the ejection column, those vertical and level speed fields might make computed starting with more hypothetical investigations and attention from claiming impostor coherence Carey & Sparks (1986). Both vertical velocity and column height are powerful function of magma release rate. The absence of wind by the maximum width of the clast can be used to determine the maximum range of clast.

In order to restrict the scope of eruption direction, angles and velocity, the 3D ballistic trajectory model and inverse model were utilized. The model reveals that those blocks were