Development of New Theory for Superior Mirage and Fata Morgana Mirage

Sapmee, Kamonsap (School: Benjamarachutit School)

A temperature inversion is a phenomenon where warm air lies on top of cool air. This results in a decreasing light refractive index as the height increases. The layer that makes the light ray bend from the normal line leads to a superior mirage or a Fata Morgana mirage which are different in appearance. In this project I aimed to develop a mathematical model of these phenomena describing it leading me to develop further theoretical understanding of the phenomenon. I aimed to formulate 1) an equation describing laser ray in medium with varying index of refraction and 2) a theory to distinguish between a superior mirage and Fata Morgana using the created scientific model and mathematical equation. The model was built from a 4 mm thick transparent acrylic forming a rectangular parallelepiped with dimensions of 90.0 x 5.0 x 45.0 cm (length X width X height.). It contained 14 layers of different-concentration sucrose solution, acting as the atmosphere while a 635 nm 1 mW laser-pointer was utilized as the light source for geometrical optics modeling. Tracker video analysis was used to measure light ray position and distance. As a result, the equation was defined as a sine function. The equation was capable describing the relation between related variables and the function of light ray in the model. In addition, the model was able to distinguish between a superior mirage and a Fata Morgana.

Awards Won: