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Project 4

**Hurricane Forecasting**

 Differential equations have been used for a long time in real world applications. In 1693, Gottfried Wilhelm Leibniz and Jakob Bernoulli, using Isaac Newton’s fluxional equations as a baseline, and added to it to help find how complex systems work in detail. One of the many applications that use differential equations.

 One of the many ways differential equations are used is to project when a hurricane will appear and where it will go. This is extremely useful because it lets us know when a hurricane will form and the traction of it, so people can have enough time to prepare to evacuate or wait for it to pass by. The equations that scientist and researchers use are called shallow water equations. These are partial non-linear equations that can detect and explain waves, changes in the coast line, and storm surges to predict when a hurricane will show up. Shallow water equations are split into 2 first order nonlinear equations. The most common equations are Navier Stokes equations.

1. For the first equation H is how deep the fluid layer is. While h is how fast the water is elevating, and v is the projected velocity of the water by factors both in and outside the water. ∂ is the dimension of the water

$$\frac{∂h}{∂t}+∇\*\left(v\left(H\*h\right)\right)=0$$

1. Most of the variables in the first equation are the same for the second, but the second one has 2 more variables. g is the accelerated gravity and s is the intrinsic viscosity which is the weight of the water.$$\frac{∂vh}{∂t}+∇\*\left(v\*vh\right)+g∇h=s(v,h)$$

 In conclusion, researchers use these formulas to get a heads up on when hurricanes will come and the traction of where it will go. It is a daily job that requires constant observation to see when a hurricane will happen. Differential equations can be used for the benefit of countless people’s lives and prevent natural disasters from causing as much damage as they possible can.

Sources:

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