

# Model Documentation of the:

## Lorentz Attractor

### 1 Nomenclature

#### 1.1 Nomenclature for Model Equations

- $x$  is proportional to convection motions
- $y$  is proportional to temperature difference between ascending and descending currents
- $z$  is proportional to distortion of vertical temperature profile from linearity
- $\sigma$  Prandtl Number
- $r$  quotient of Raileigh Number and a critical value (see [1])
- $b$  parameter

### 2 Model Equations

State Vector and Input Vector:

$$\underline{x} = (x_1 \ x_2 \ x_3)^T = (x \ y \ z)^T$$
$$\underline{u} = \emptyset$$

Model Equations:

$$\dot{x} = -\sigma x + \sigma y \tag{1a}$$

$$\dot{y} = -xz + rx - y \tag{1b}$$

$$\dot{z} = xy - bz \tag{1c}$$

Parameters:  $\sigma$ ,  $r$ ,  $b$

Outputs:

#### 2.1 Exemplary parameter values

Parameter Name	Symbol	Value
Prandtl Number	$r$	35
Raileight coeff	$b$	2
Parameter	$\sigma$	20

### 3 Derivation and Explanation

### References

- [1] Lorenz, E. N.: *Deterministic Nonperiodic Flow*, p. 135, Journal of Atmospheric Sciences 1963