Climate Change Model

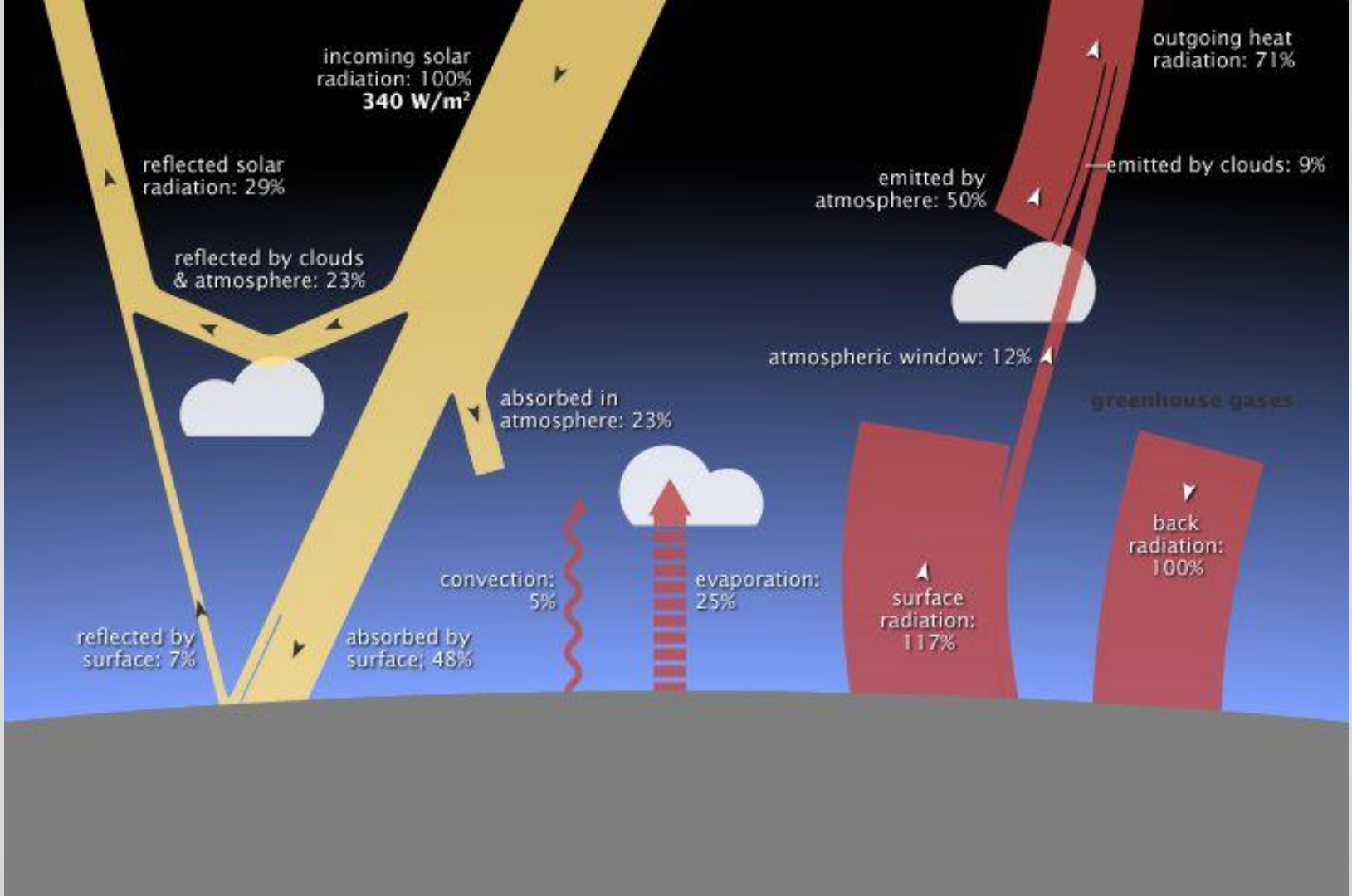
by Srinivasa Raghavendra Bhuvan Gummidi & Milan Šećerov

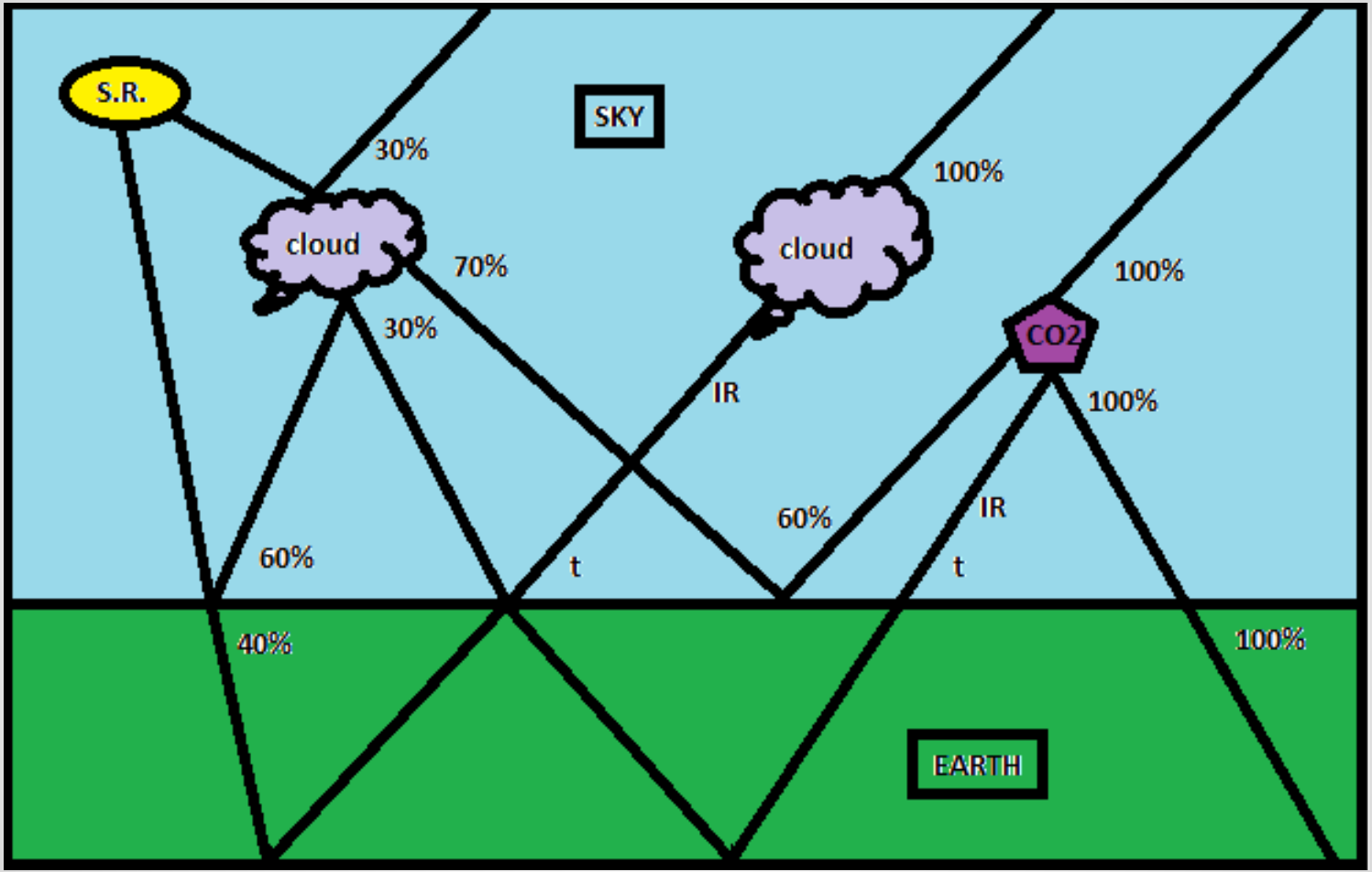
Introduction

- Climate Change
- Global Warming
- CO2
- Greenhouse effect

Introduction

- Sunrays
- Clouds
- Earth
- Albedo
- Infrared waves
- CO_2


incoming solar
radiation: 100%
340 W/m²
reflected solar
radiation: 29%
reflected by clouds
& atmosphere: 23%
absorbed in
atmosphere: 23%
reflected by
surface: 7%
absorbed by
surface: 48%
convection:
5%
evaporation:
25%
outgoing heat
radiation: 71%
emitted by clouds: 9%
emitted by
atmosphere: 50%
atmospheric window: 12%
greenhouse gases
surface
radiation:
117%
back
radiation:
100%


S.R.
SKY
30%
cloud
70%
30%
cloud
100%
100%
CO2
100%
IR
60%
t
60%
IR
t
40%
100%
EARTH

Model

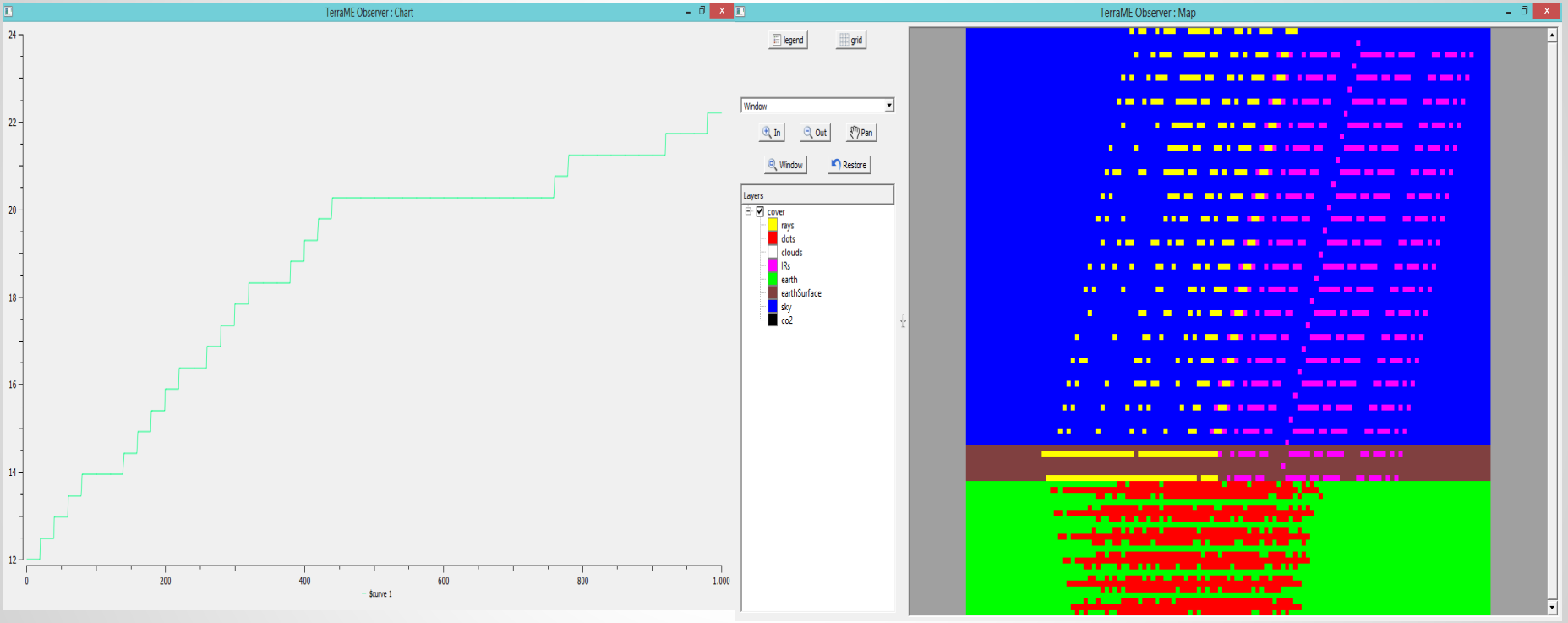
- Cellular Automata based model
- Uses the TerraMe concepts of Neighborhood, environment, society and Timer,etc.
- Helps in understanding the effects of different parameters in global warming like carbon dioxide concentrations, cloud cover,etc
- Assuming that the entire earth has same albedo and earth can be heated uniformly

Parameters of Model

- Albedo of Earth
- Albedo of Clouds
- Rate at which Earth loses Heat after a certain threshold temperature
- Threshold and Initial Temperature
- Add or Remove Clouds
- Concentration of co2 molecules in the atmosphere

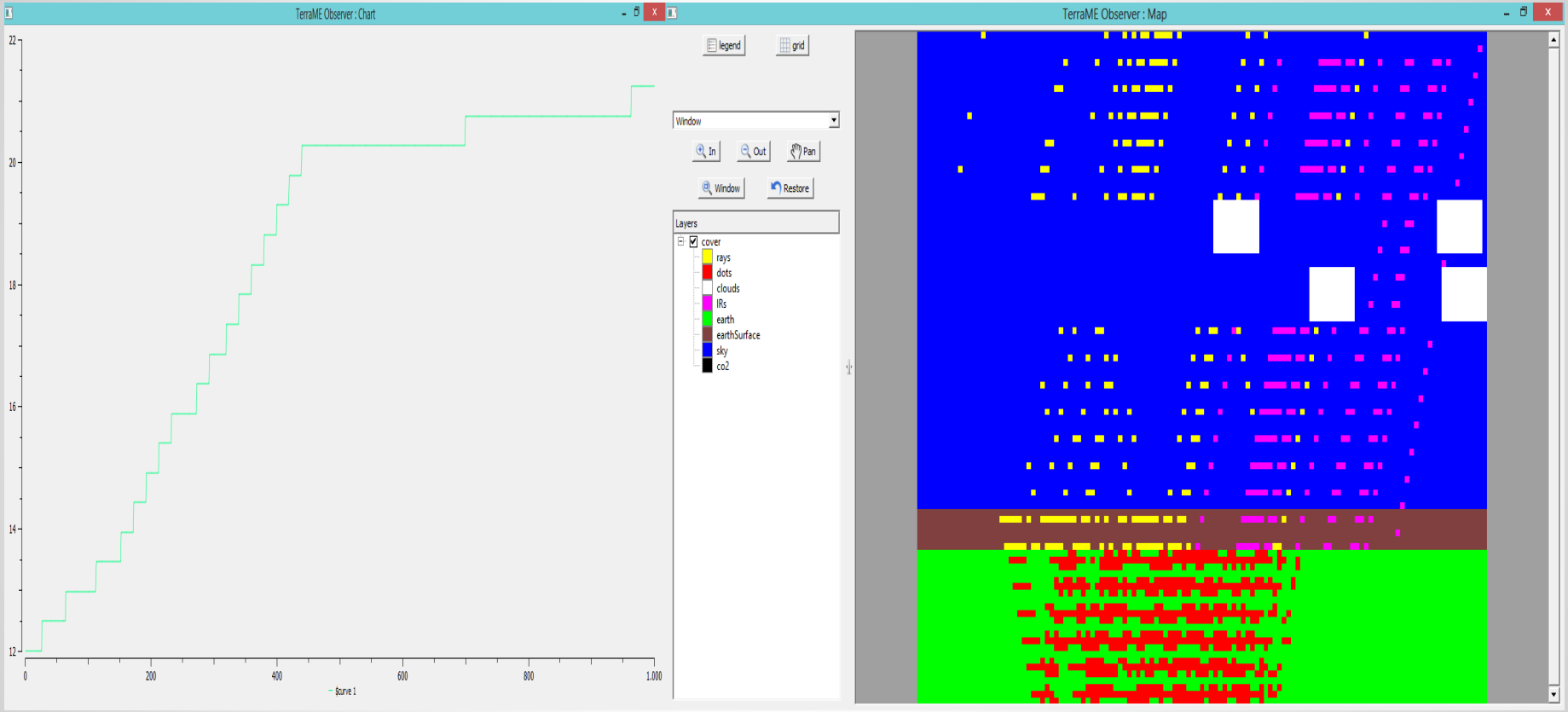
Running the model...

Inferences



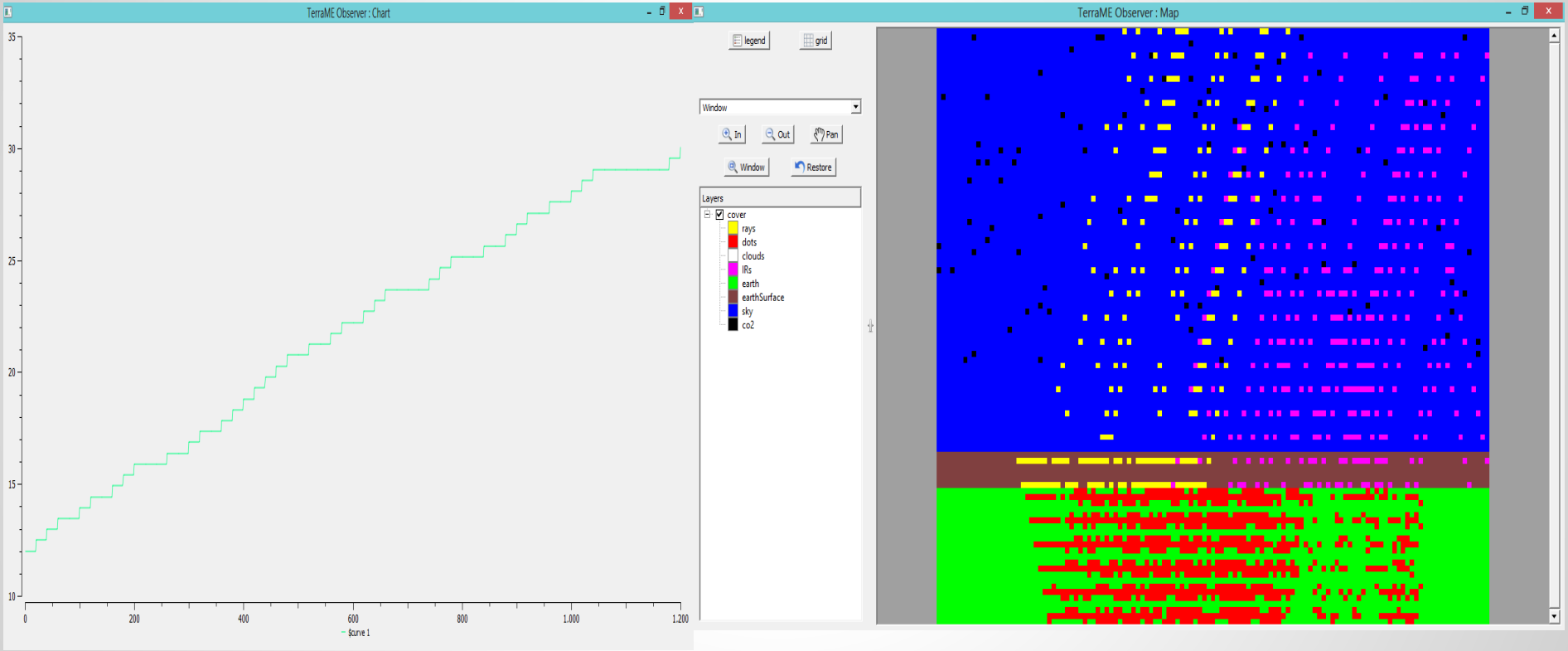
When there are no clouds and no co2 molecules(Albedo: Earth-0.6 & Clouds-0.7)

Inferences



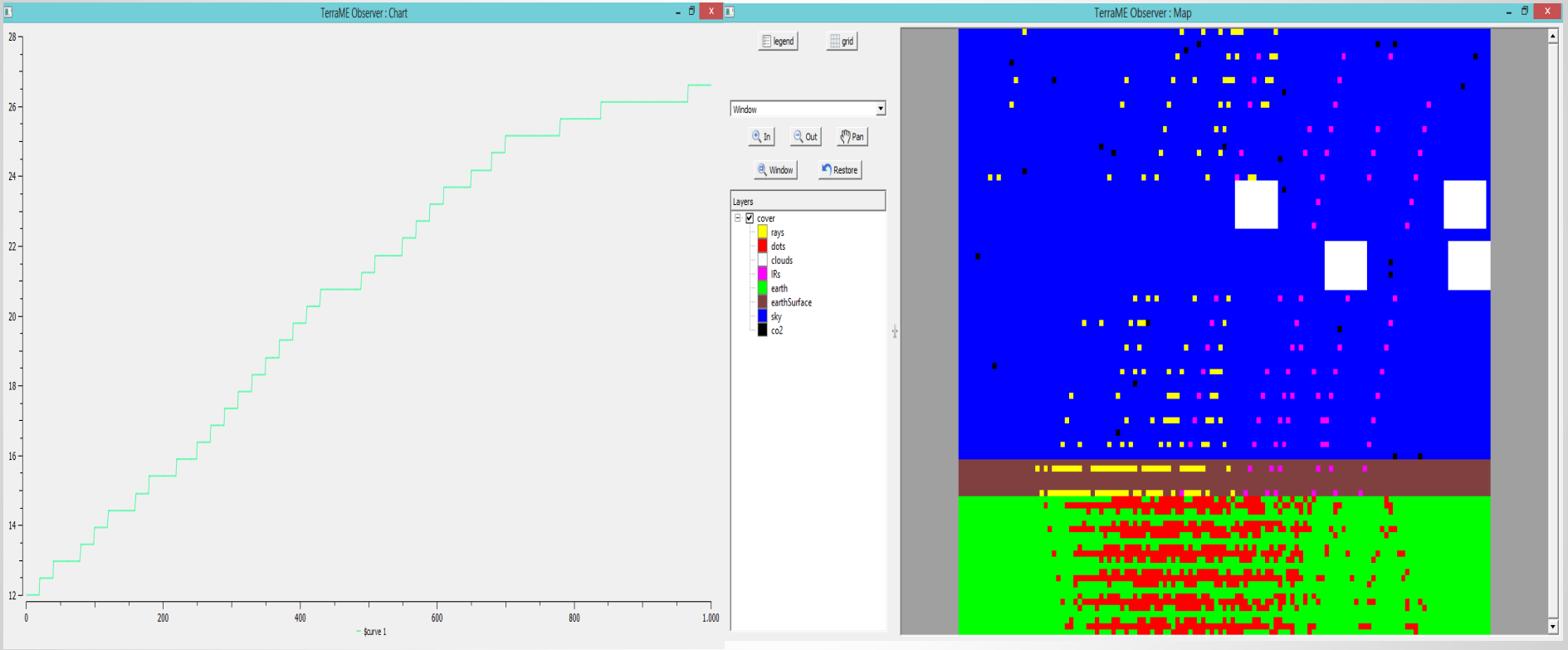
When there are two clouds and no co2 molecules(Albedo: Earth-0.6 & Clouds-0.7)

Inferences



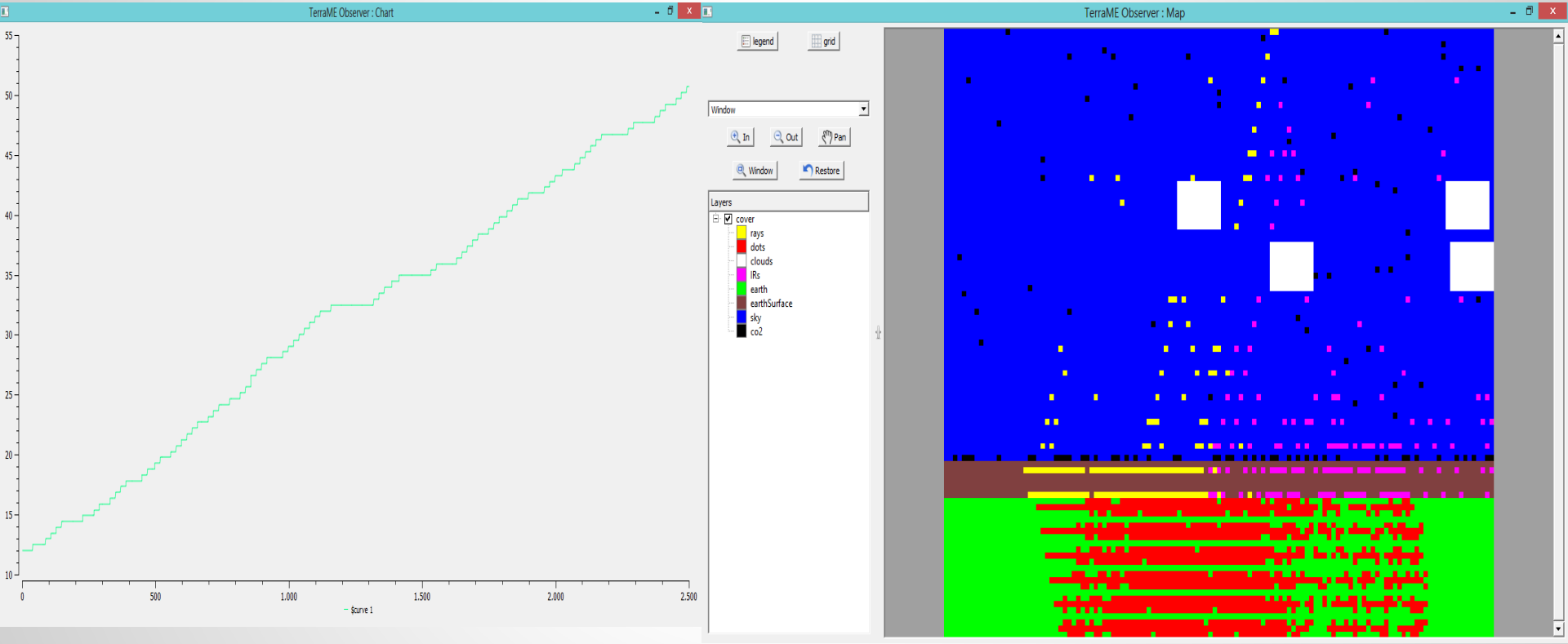
When there are no clouds and 100 co2 molecules(Albedo: Earth-0.6 & Clouds-0.7)

Inferences



When there are two clouds and 25 co2 molecules(Albedo: Earth-0.6 & Clouds-0.7)

Inferences



When there are two clouds and 100 co2 molecules(Albedo: Earth-0.6 & Clouds-0.7)

Extending the Model

1. Try to model the clouds in irregular shapes based on different cloud types like Cirras,etc.
2. Adding different features on Earth with different albedo like snow, vegetation, water bodies, etc.
3. Try to vary the angle of sunlight and its impact on albedo.
4. Try to add symbols for different features like rays, IRs, CO_2 molecules, etc
5. Try to replicate ray behaviour to reflected rays and IRs
6. Try to control the number of clouds in the atmosphere.

Thank You! Comments?