

# **Stored Textures**

**CSCI 4239/5239**

**Advanced Computer Graphics**

**Spring 2024**

# What are Stored Textures

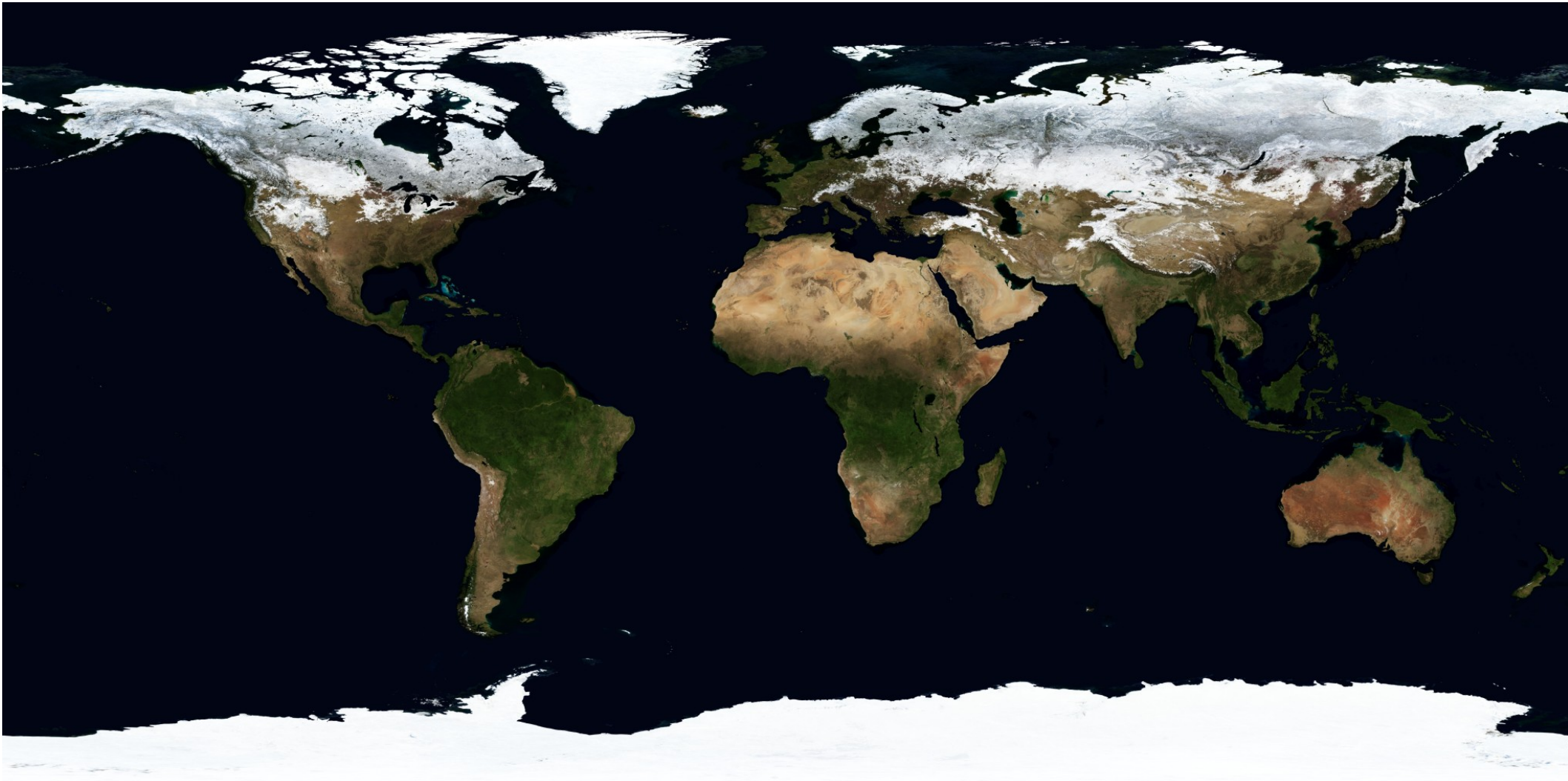
- Textures in OpenGL are Stored Textures
  - Not computed by shader but sampled by shader
  - Usually 2D
  - Simultaneous textures through multi-textures
- Textures are applied in shader
  - sampler2D point to texture units
  - texture2D sample textures
  - texture coordinates used to identify pixels

# Blue Marble Example

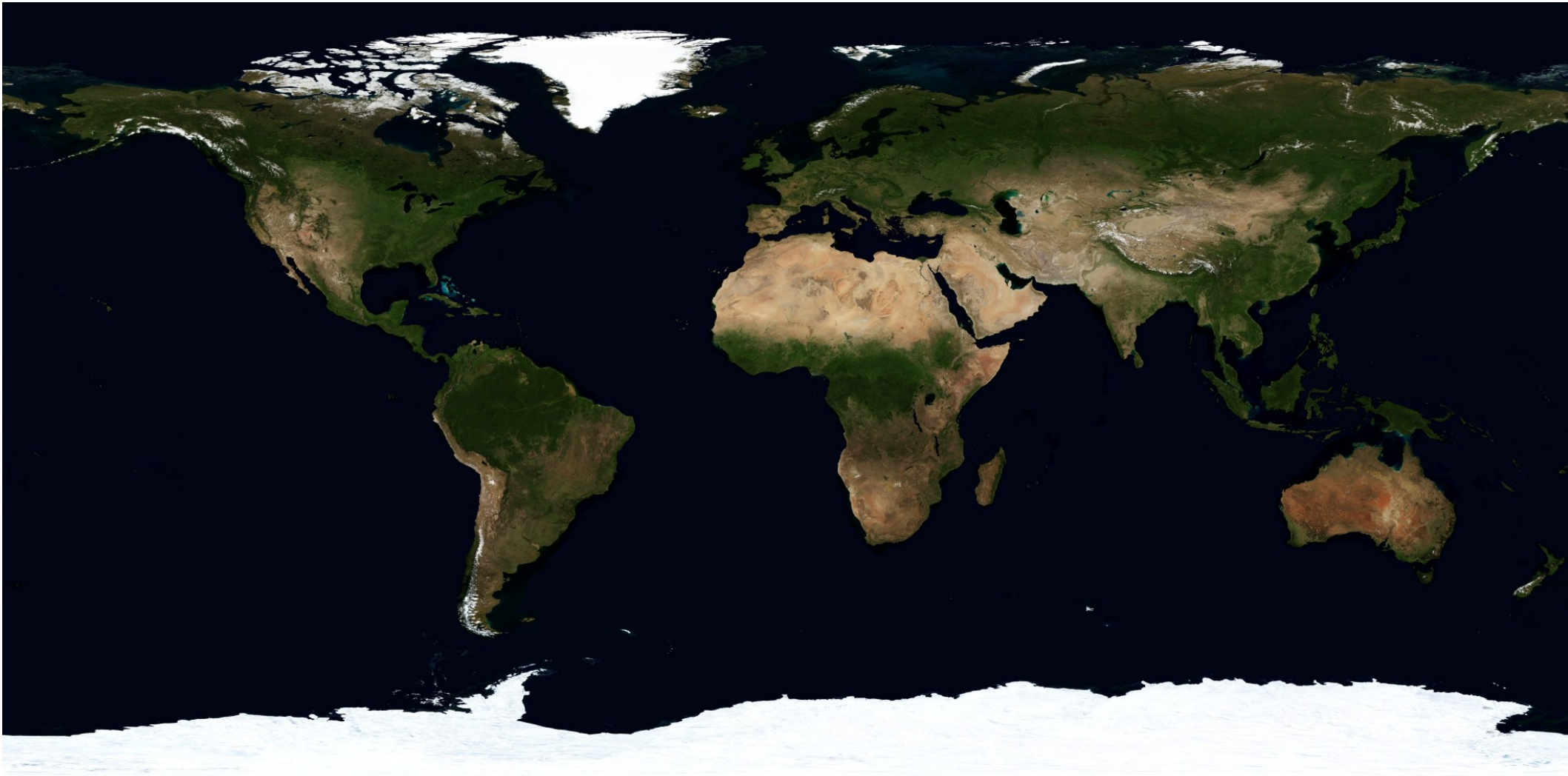
- MODIS satellite data
  - 1km raw resolution
- High resolution textures
  - Monthly cloudless daytime
  - Earth's city lights
  - Clouds
- Mercator projection
  - Works with gluSphere



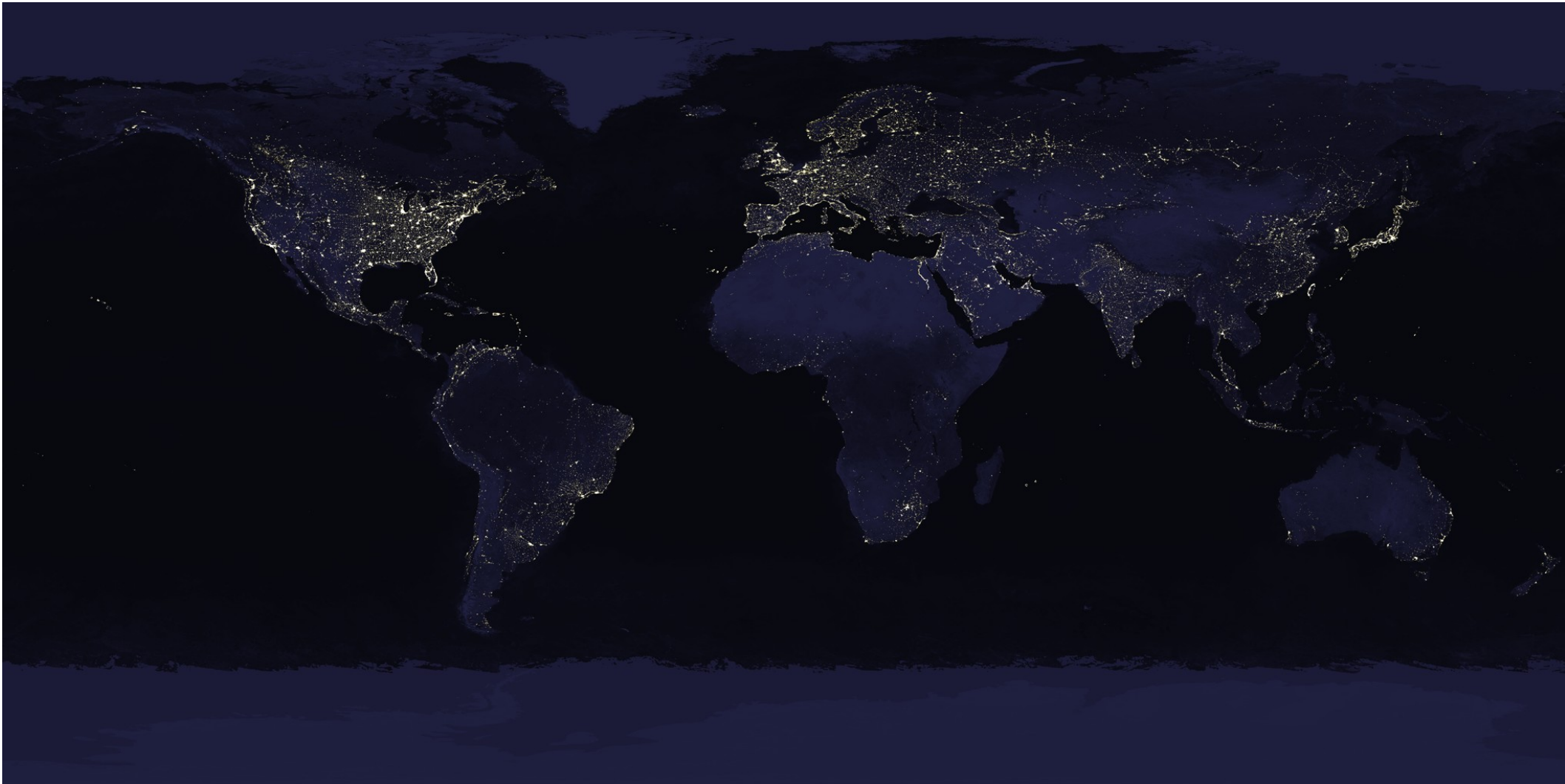
# January Daytime Texture



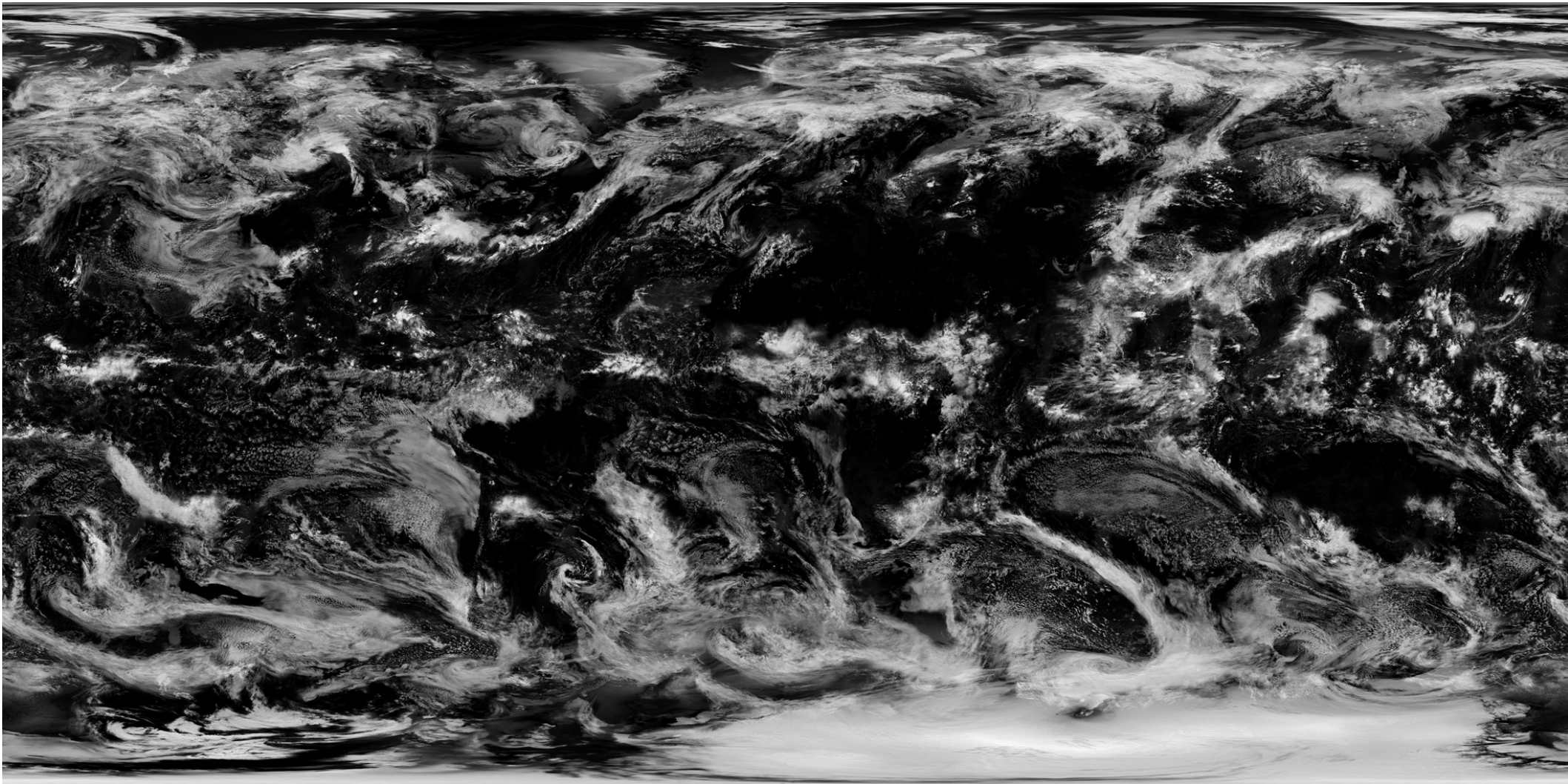
# July Daytime Texture



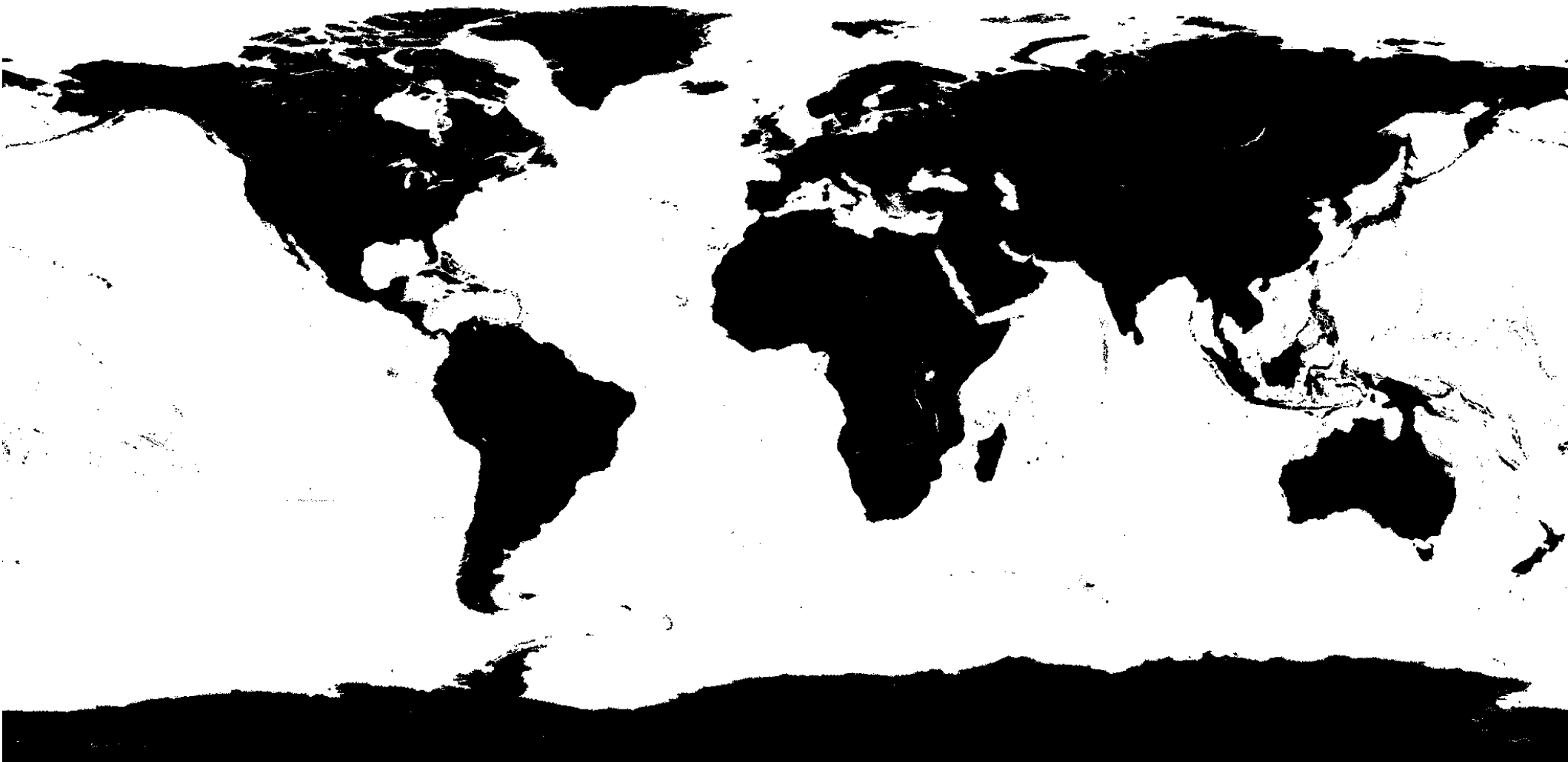
# Nighttime Texture



# Cloud Texture



# Gloss (Ocean) Texture

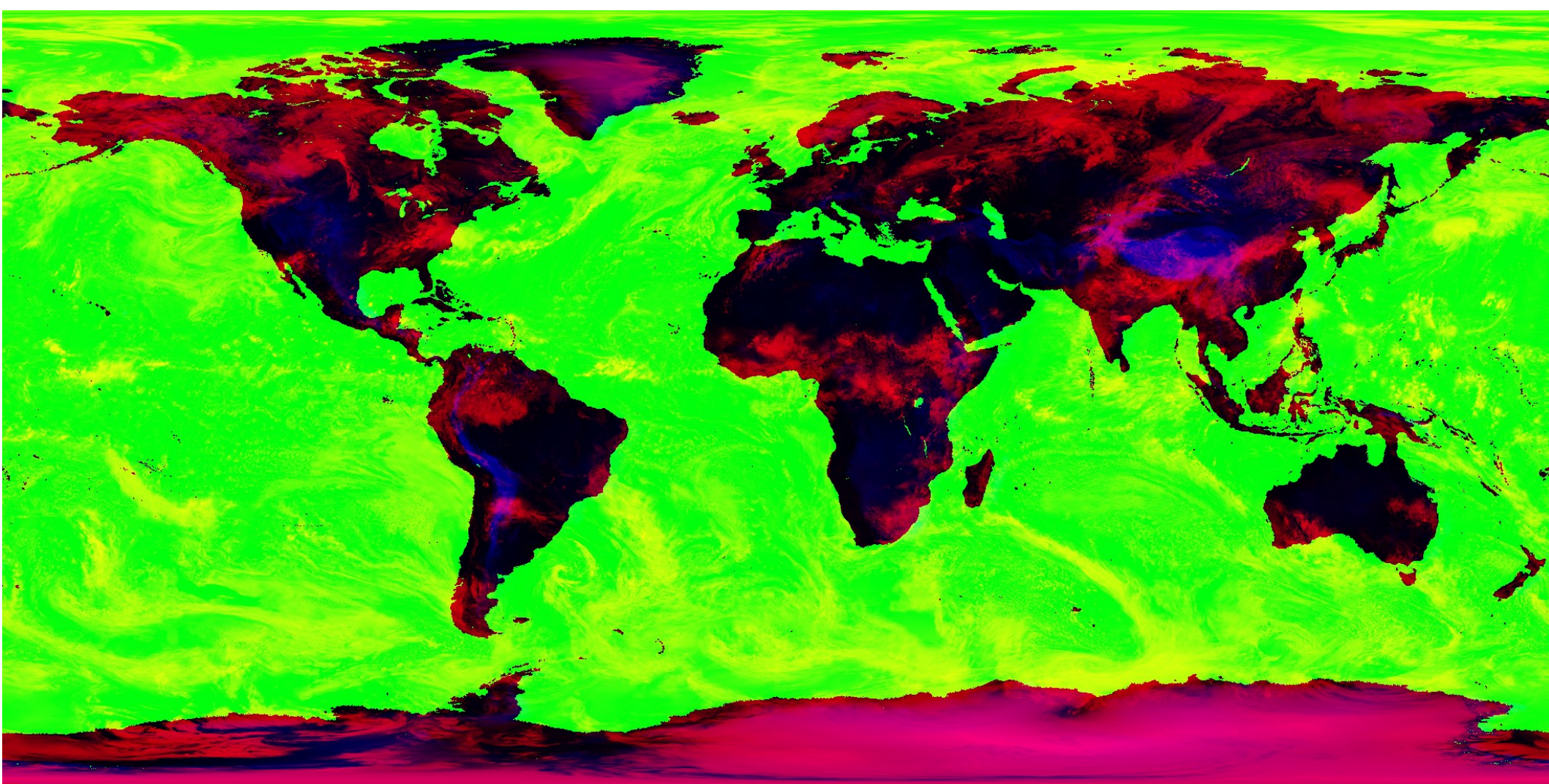




# Elevation Texture



Cloud (R) Gloss (G) Elevation (B)



# Tasks

- Compute lighting
  - Gloss sets specular shininess
- Mix daytime textures to day of year
- Mix day and night textures
- Mix cloud with image
  - Reflects sun during day
  - Block lights at night

# Passing textures to shaders

- Select texture units
  - `glActiveTexture(GL_TEXTUREx)`
- Select active texture
  - `glBindTexture(GL_TEXTURE_2D , name)`
- Map sampler to multitexture
  - `id = glGetUniformLocation(shader , varname)`
  - `glUniform1i(id , x)`
    - **x** is 0,1,2,3 - texture unit
- In shader access is by sampler
  - `texture2D(varname , texture_coords)`

# This is what it should look like

- Photograph from Apollo 17
  - Bright everywhere
  - Light blue oceans
  - Bright white clouds
- Lighting properties
  - Sun far away
  - Refraction

