THE STANDARD

Atmospheric & Oceanic Circulation & Climate

Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

DCI — DISCIPLINARY CORE IDEA

ESS2.C · The Roles of Water in Earth's Surface Processes

> *Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.*

Sunlight hits Earth unevenly. The equator gets a direct overhead angle, the poles get a low slanted angle, and that mismatch sets the whole system in motion. Warm air rises near the equator, cooler air sinks near the poles, and Earth's rotation bends the moving air sideways. The same uneven heating drives ocean currents, which carry warm and cold water around the planet. **Together these flows decide what climate a region gets.**

SEP — SCIENCE & ENGINEERING PRACTICE

Developing and Using Models

> *Develop and use a model to describe phenomena.*

Students aren't memorizing a list of wind belts. They're building a model (a diagram, a map, a globe with arrows) that shows how heat input and Earth's spin produce circulation patterns. Then they use the model to describe a real climate. **The model has to do work: predict where wind goes, explain why a place is wet or dry, connect a current to a coastline.**

CCC — CROSSCUTTING CONCEPT

Systems and System Models

> *Models can be used to represent systems and their interactions, such as inputs, processes and outputs, and energy, matter, and information flows within systems.*

Atmosphere and ocean act as one big system with inputs (sunlight), processes (rising, sinking, deflecting, flowing), and outputs (regional climates). Students treat the planet as a system and trace energy and matter moving through it. **The model is the system in miniature.**