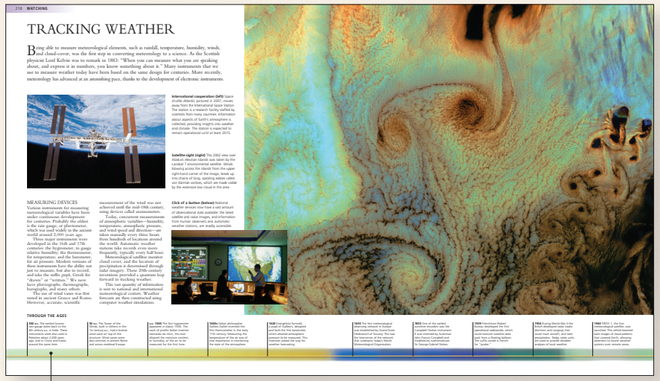
EXTREMES

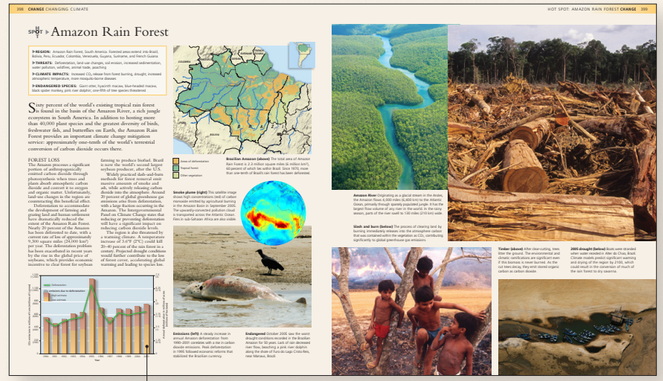
HOW TO USE THIS BOOK

This book is divided into six sections: Engine, Action, Extremes, Watching, Climate, and Change. Engine gives an overview of Earth's atmosphere and its global systems. Action explains the workings of general weather phenomena, such as clouds, rain, and snow. Extremes looks at devastating weather events, including tornadoes, hurricanes, and drought. Watching covers the science of meteorology, from ancient times to today. Climate tours the climate zones of the world. The final section, Change, provides a compelling portrait of our relationship with Earth and the effects of climate change. Each section is broken down into chapters devoted to particular subjects. Each chapter begins with an introduction to the subject (right), providing a general overview, then the subject is explored in detail in the pages that follow (examples are below). Special features, called "Insights" (far right), look at the evolution of our knowledge about weather and climate through text, illustrations, charts and graphs, maps, and photographs.

INTRODUCTORY FEATURE



INSIGHTS



Section and chapter heading
This indicates the broad theme and specific area under discussion.

Global locator map
This pinpoints the location of the key regional examples discussed below it.

Timeline
This provides information about key developments through the ages.

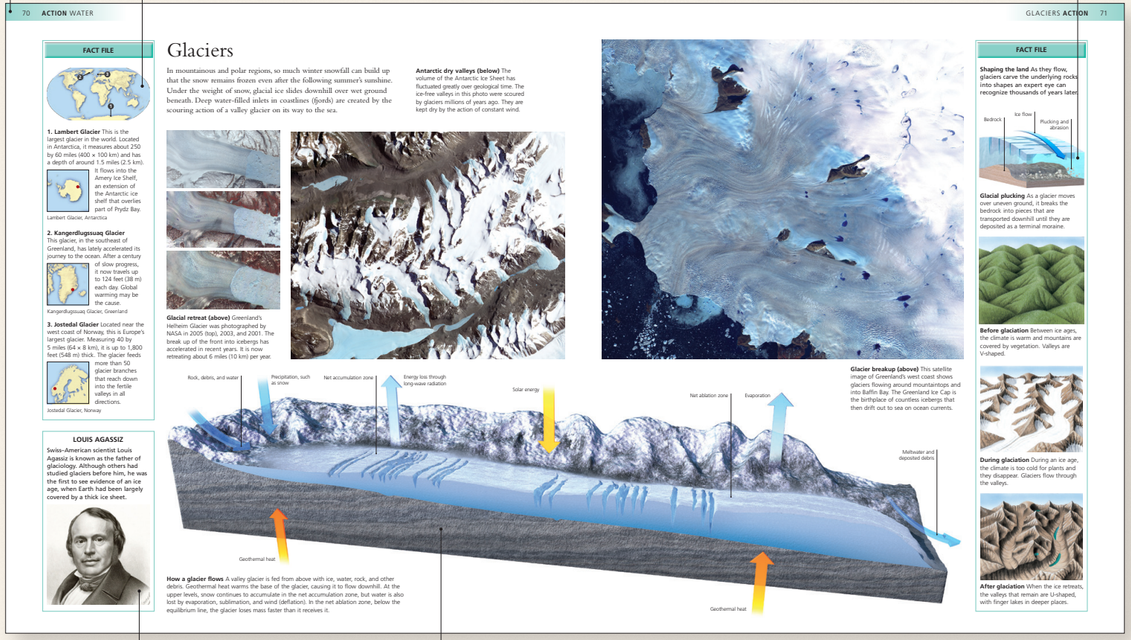
Diagrams
Where appropriate, diagrams are included to illustrate complex concepts.

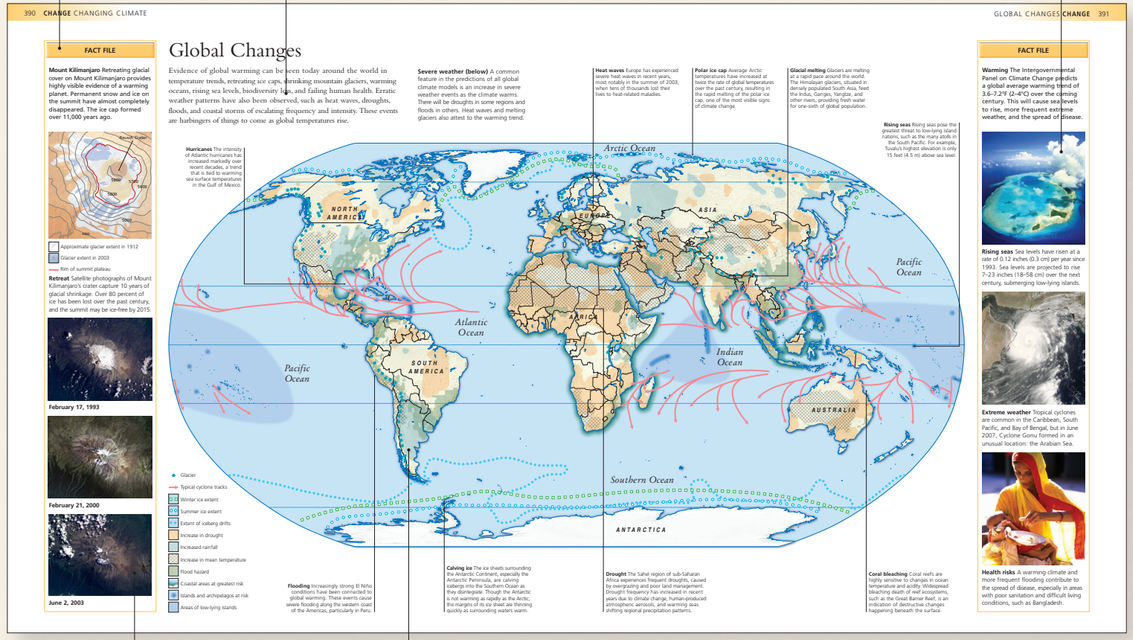
Fact file
This panel explains processes or profiles several examples of the subject under discussion.

Introductory text
This provides a general overview of the subject.

Charts and graphs
These group data and present statistics and forecasts in an easy-to-understand format.

Photograph
An evocative photograph shows a landform or feature that is representative of the subject matter under discussion.





Feature box
Photographs or illustrations, and text, highlight an interesting aspect of the topic being explored.

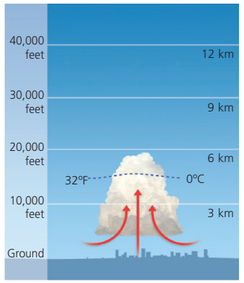
Illustration
A graphic cutaway illustration shows the inner workings of a physical phenomenon.

Satellite photography
Images taken from space provide unique perspectives on Earth.

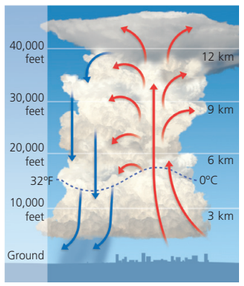
World map
This shows the global distribution of a feature being profiled, and is accompanied by text that discusses the feature in more detail.

FACT FILE

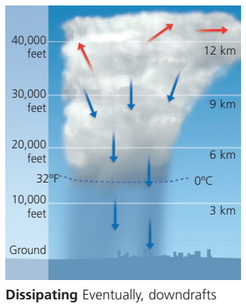
Stages of a storm A typical thunderstorm grows, reaches maturity, and decays in under an hour. Occasionally, more intense, severe storms last much longer. They all pass through three distinct stages.



Towering cumulus Condensing water to make the cloud heats the air. Updrafts prevail within the cloud and the cloud rapidly grows in height.



Mature The updraft spreads out and forms the anvil when striking the stable stratosphere. A downdraft forms where air is cooled, lowering the freezing level. Precipitation begins falling.

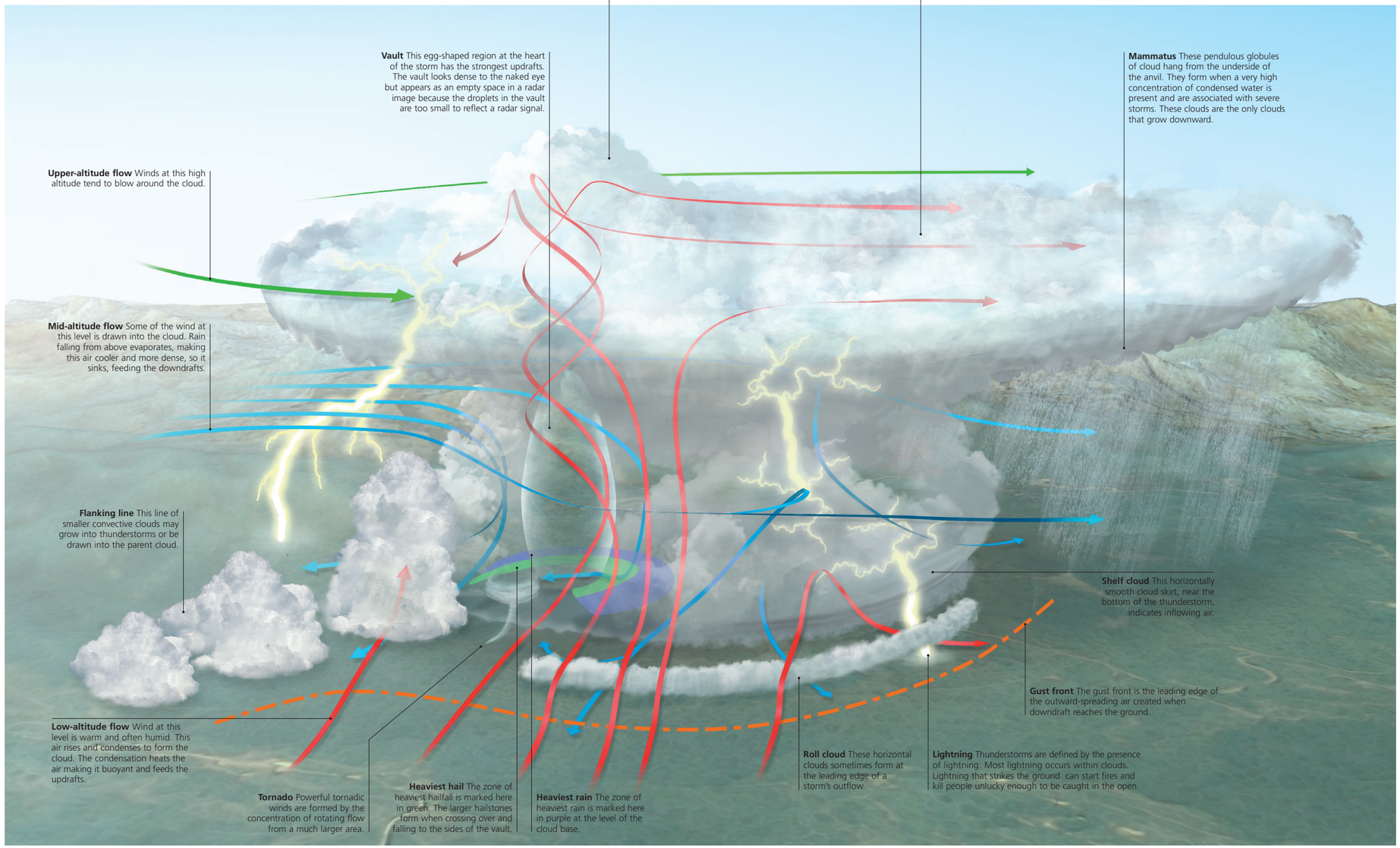


Dissipating Eventually, downdrafts predominate, shut off the supply of warm air, and the cloud dissipates.

Thunderstorms continued

The power in a thunderstorm is immense. Energy is released when water vapor condenses and rain falls out. The amount of energy generated during an average thunderstorm is about 10 times the energy produced by the world's largest hydroelectric dam. Most of this energy heats the air, but a small fraction drives the strong winds of the thunderstorm.

Inside a thunderstorm This illustration of a supercell thunderstorm shows all the major components. All thunderstorms have updrafts and downdrafts. Severe storms have a complex structure, where downdrafts reinforce updrafts. Some storms occur in an environment where the wind direction changes with height, initiating horizontally rotating winds within the storm.

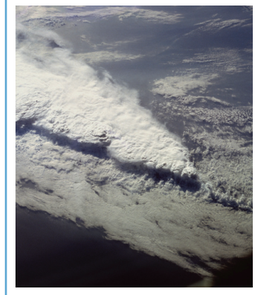


FACT FILE

Thunderstorm organization Flow rising up a mountain favors a single storm. Sometimes a group of storms persist when the spreading downdrafts initiate new convection. At other times, a weather front organizes storms into a line.

Single storm This is an isolated thunderstorm. The spreading anvil has cast a shadow onto lower clouds to the left. Smaller convection clouds flank the sides of the thunderstorm.

Storm cluster Here, three overshooting tops from a cluster of thunderstorms cast shadows on the anvil cloud. In the tropics, such clusters can be the seed for a tropical cyclone.



Squall line A cold front has created a line of thunderstorms, with developing storms on the right. Dissipating storms are on the left, where anvil tops have merged to form a single broad deck of high cloud.