SAMPLE

Earth's Dynamic Systems: Cloud Types

Reading the Sky

Aira Astralis

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Introduction

Ask anyone to describe the sky and they will reach for cloud words almost at once: wispy, towering, grey, billowing, threatening. This book is about the system that gives those impressions a vocabulary, the classification of clouds into types. It is a scheme that begins with ten familiar genera, from fair-weather cumulus to thunderhead cumulonimbus, and then fans out into species, varieties and supplementary features, each with a Latin name and a precise meaning.

The genera are sorted by the altitude of their bases and by the physical form of the cloud itself: high cirriform wisps, stratiform sheets, stratocumuliform bands of little rolls, heaped cumuliform clouds and the towering cumulonimbiform giants. Within each genus the observer can usually name a species, such as the turreted castellanus or the lens-shaped lenticularis, and often a variety as well, describing opacity or pattern. Even supplementary attachments, from anvil tops to funnel clouds, carry official labels.

Why bother with such precision? Because names are what turn a passing impression into data. A weather log that says simply "cloudy" is nearly useless; one that says cirrus uncinus thickening to cirrostratus tells a story that any other observer, anywhere in the world, can read and extend. Classification is the technology that lets one person's sky be compared with another's.

The story of how this nomenclature came to be, what each type looks like, how the types arise physically, and where else in the Solar System they occur, is set out over the following chapters. The aim throughout is practical: by the end, a reader should be able to look at any sky and give its clouds their proper names.

Chapter 1: The Discovery of Cloud Types

Clouds are among the most photographed and most talked-about objects in nature, yet for most of human history they had no agreed names at all. Farmers and sailors read them expertly, drawing on generations of weather lore: a sky streaked with mares' tails promised wind, a low dark lid promised rain, and a mackerel sky of dappled high ripples was watched with suspicion. These folk categories were local and inconsistent, however, useful to the people who coined them but meaningless a hundred miles away, where the same proverb described a different sky.

The obstacle was not observation but language. Without shared names, no two observers could compare what they had seen, keep records, or test a forecast against what actually arrived. Naturalists had long since settled on Latin binomials for plants and animals, but the sky's objects were changeless only in their changeability: borderless, short-lived, and never twice the same, they resisted any obvious taxonomy. What was needed was a way to sort clouds by their stable, visible characteristics rather than by the weather they happened to bring.

Early attempts nibbled at the problem. Seventeenth-century diarists described clouds as best they could with borrowed words, and a few natural philosophers sketched schemes of their own, but nothing caught on, because nothing yet named the shapes in a way other people could verify. A French naturalist proposed a descriptive French nomenclature at the very start of the nineteenth century, cataloguing cloud forms in his own language, but it was a rival proposal, made in Latin, that conquered the world. That story, and the amateur meteorologist behind it, belong to Chapter 8.

From those roots the modern system grew steadily. The World Meteorological Organization's International Cloud Atlas now recognises ten genera, sorted into high, middle and low etages by the height of their bases, with a handful of vertical genera that begin low but extend upward through several levels. The altitudes themselves shift with latitude, because the troposphere is deepest at the equator: high clouds begin around 6 kilometres in temperate zones but only 3 to 5 kilometres near the poles, and the middle and low etages shift down accordingly.

The genera themselves fall into five physical forms: cirriform, the detached icy filaments of the high atmosphere; stratiform, widespread sheets and veils; stratocumuliform, patches and rolls joined in a layer; cumuliform, heaped convective clouds; and cumulonimbiform, the huge deep convective towers. Every genus belongs to exactly one form, which is why a name can hint at

altitude and anatomy at the same time.

The refinement goes much further than the genus level. Most genera can be subdivided into species that describe characteristic internal structure, so that a single term such as cirrus uncinus calls to mind a definite picture: hooked, comma-shaped ice filaments. Where a cloud's transparency or arrangement matters, a variety can be appended, giving combinations like altocumulus stratiformis translucidus. The system also names the attachments and transformations of clouds: supplementary features such as the anvil- shaped incus, and mother clouds that generate new genera while visibly keeping their origins, as when a cumulus spreads into a stratocumulus layer.

Two other layers of the atmosphere host clouds of their own. In the cold dry stratosphere, nacreous or polar stratospheric clouds glow with mother-of-pearl colours near the poles, some of them formed of nitric acid and water ices that participate in ozone chemistry. Higher still, at the edge of space around 80 kilometres, noctilucent clouds of ice shine silver-blue long after sunset. They come in characteristic structures, from tenuous veils to sharp-edged bands, billows and whirls, and because they are so faint they are best seen at twilight from high latitudes, where the lower atmosphere is dark and the mesosphere is still lit.

The seventeenth century produced the first serious proposal. Robert Hooke, surveying the sky for the early Royal Society, sketched a working set of cloud drawings and Latin-tinged terms in his weather diary scheme, an attempt that read well on paper but never spread beyond a small circle of correspondents. Without a printing press behind it, or a network of observers to use it, a nomenclature was just a private code. The lesson would hold for a century and a half: cloud names travel only as fast as the observers who trade them.

The atlas that eventually grew from all this has its own lineage, worth naming because observers still cite its editions. International meteorologists agreed in the late nineteenth century to standardise Howard's terms with altitude prefixes; the first International Cloud Atlas proper appeared in the 1950s, its photographs and definitions the shared property of every weather service; and a revised edition in the 1970s locked in the species and varieties still taught today. In 2017 the atlas went online and open, adding new categories born from photographs sent in by the public, and turning a hundred-year-old reference work into a living record that any observer can consult in the field.

The chapters that follow work through this nomenclature in order: the genera by height, the species, the varieties, and then the named features and special clouds that complete the atlas.

End of free sample. The full book is available at putrabooks.github.io

ABOUT THE AUTHOR

Aira Astralis is a science writer specializing in astronomy and space exploration. Her work spans the full breadth of humanity's relationship with the cosmos -- from the earliest naked-eye observations to the engineering marvels of modern space missions.

Her books are built on a foundation of primary sources: peer-reviewed research, mission archives, and direct engagement with the scientific community. She writes for readers who want to understand not just what we know about the universe, but how we came to know it.

She believes that the most important frontier is not out there but in the gap between what scientists discover and what the public understands. Her books exist to close that gap.