

Preface

SOMETHING IN THE AIR

“Have you heard about that new restaurant on the Moon? The food’s pretty good, but the place has no atmosphere.”

It’s an old joke, but it points out how important atmosphere is to us. It’s no wonder – we live on the seafloor of a great ocean of air. This ocean is roughly 90 miles deep, with currents and eddies, whirlpools and waves. At our depth, the ocean above and around us presses down on each square inch of our bodies with a weight of 14.7 lb.¹ It’s a brew of nitrogen, oxygen, carbon dioxide, some rarer gases, a bit of pollen and smog thrown in for good measure, and a substantial amount of water vapor. The humidity is responsible for hail, sleet, rainfall, and snowstorms, all of which end up as a different kind of ocean defining the shores of our continents.

We are used to this ocean around us, used to its weather patterns, storms, and seasons. Earth’s atmosphere is unique. No other world in our Solar System has anything like it. But there are other oceans of air surrounding distant worlds, and these oceans would seem truly alien to us. In fact, the weather on other worlds is terrifying, inspiring, and baffling. Lightning bolts sizzle through Jupiter’s atmosphere, powerful enough to run a small town for days. Hydrocarbon showers fall on Saturn’s moon Titan, and sulfuric acid rains down on Venus. Snows drift from carbon dioxide clouds on Mars and methane ice crystal hazes on Neptune, where blue storms the size of Earth come and go in a matter of months.

Will we ever see these places up close? Will we fly on their winds or float among their thunderheads? Engineers are drawing up plans to do just that. In this book, we will journey with them. We’ll travel, vicariously, to the planets and moons blanketed by substantial air, ones that generate dramatic weather. These include Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Saturn’s planet-sized moon Titan. We’ll take a side trip to Neptune’s moon Triton, a world with a weather system somewhere between Earth’s and the hard vacuum of space. Along the way, we’ll meet inventors and their inventions designed to tell us about planetary atmospheres. We’ll chat with scientists on the cutting edge of today’s research, and take inventory of past and present explorations. Finally, we’ll look at future possibilities: What is to

1. This is the pressure at sea level. Pressure in Denver, CO – the “Mile-High City” – is roughly 12.2 psi, and on top of Earth’s highest mountains it hovers at 4.4 psi.

come, and how will it benefit us? What advanced probe designs are on the table, and what's already on the factory floor?

So sit back, relax, and enjoy a ride through alien skies.

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Drifting on Alien Winds

Exploring the Skies and Weather of Other Worlds

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