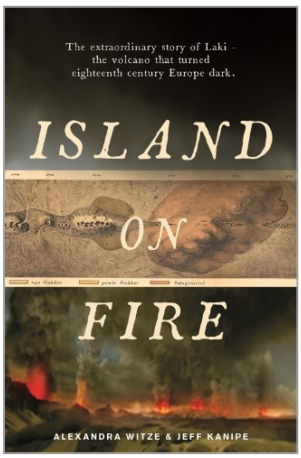
Book review: Island on Fire



By Alexandra Witze and Jeff Kanipe

PROFILE BOOKS

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Volcanoes are no unusual sight in Iceland and yet the eruption that started on June 8, 1783 in the southern district of Síða was something never seen before. In the following eight months, an estimated 14 cubic kilometres of lava poured out from 135 fissures opening north of the town of Klaustur covering some 2,500 square kilometres of land and threatening to overrun not only many of the surrounding farms but the town itself. The volcanic ash carried away by the wind poisoned the land, killing half of the Icelandic cattle population and a quarter of the sheep and horse population. In the resulting famine (1783–1784), an estimated nine thousand people, one-fifth of the population of Iceland, died.

But the eruption of Laki – as this new formed chain of volcanoes was named – had possibly even more widespread effects. In the years that followed the event, the climate in Europe deteriorated and the exceptional hot summer of 1783 was followed by long and harsh winters. The resulting crop failures may even have triggered one of the most famous insurrections of starving people in history, the French Revolution of 1789–1799 (though the French peasants had many other, mostly political and financial, reasons to overthrow the government). Other accounts for droughts, exceptional cold winters and floods are known, from North America to Japan, spanning the years 1783 to 1785.

Despite its apparent disastrous impacts on the environment, society and history, the Laki eruption is little known outside Iceland or specific geological publications. Many books (and even movies) have popularised Mount Vesuvius in Italy, Mount St. Helens in the U.S., or the great Krakatoa eruption in Indonesia. However, a popular account of the Laki eruption was missing.

Authors Alexandra Witze and Jeff Kanipe have closed this gap with Island on Fire. In this book, they present Laki's extraordinary story based on the accounts of the eruption found in contemporary documents, letters, newspaper articles and diaries, describing both the terrifying sight of the lava fountains and ash clouds In Iceland, and the years of anomalous weather and increased death rates in Europe. Interviews with volcanologists and climatologists all over the world provide context and explanation to these historic observations. Finally, the authors also visited the modern Síða district in search of surviving traces, both in the landscape and in the local communities, of the fires of Laki.

The book is subdivided in nine chapters. Every chapter explores in text, black and white images, diagrams and maps how Laki's effects spread over the eighteenth-century world, focusing on the European continent, where its impacts were strongest. A final section with endnotes provides recommended reading and references, including the used historical sources, modern scientific publications and some websites.

Chapter one sets the scene by introducing us to an extraordinary man and eyewitness of the first hour of the developing catastrophe, the clergyman in Klaustur and self-taught naturalist Jón Steingrímsson (1728–1791). His detailed description of the eruption and its aftermath forms the narrative backbone of the book. Chapter two is dedicated to basic geologic concepts, presenting also a short geological history of Iceland. It introduces the volcanoes in Laki's immediate neighbourhood, like Hekla, the 'gateway to hell', or Eyjafjallajökull, a volcano that became famous almost 230 years after the Laki eruption. Chapter three goes beyond Iceland, shortly summarising the most famous historic and prehistoric eruptions worldwide and their impacts on human history and culture.

The following chapters are dedicated to the historic descriptions of seemingly unexplainable phenomena observed all over Europe in 1783, such as a strange haze, sometimes followed by a stench, that appeared in the sky. At the time only few naturalists recognised its composition (fine volcanic ash and gaseous compounds) and origin from an Icelandic volcano. Shading the Earth from the sun and disrupting local weather systems, the arrival of the volcanic ash was usually followed by heavy rain or hail and a marked drop in temperatures. Resulting floods and storms killed people immediately. Long winters and cool summers with lowered productivity of crops had disastrous long-term effects on entire societies, based mostly on agriculture for sustenance, as described in the book.

The final chapters give a detailed overview of how volcanoes can kill, exploring the volcanic threat that our modern society still faces. The authors give examples from old eruptions, such as the one that destroyed the Roman town of Pompeii more than 2000 years ago, focusing then on more recent events and how they can affect us. The eruption of Eyjafjallajökull in 2010, for example, although of relatively moderate dimension, became a political and financial disaster. Planes and passengers were grounded for weeks due to concerns about the possibility that the volcanic ash could damage aircraft engines. The book points out that ash clouds with the characteristics of the 1783 fog could possibly paralyse the entire air traffic of the northern hemisphere and threaten the health and lives of many.

The existing detailed documentation of Laki and its climatic effects is also of great interest for atmospheric scientists. Recent volcanic eruptions with marked cooling effects, like Pinatubo in 1991, where situated near to the tropics, where wind patterns and atmospheric circulations are relatively simple and well understood. However the

rarity of great volcanic eruptions near the poles has posed great problems to scientists, trying to develop climate models fitting the particular atmospheric patterns found there. So it is still controversial whether the exceptional hot and dry summer of 1783 was a direct consequence of the Laki eruption (as the ash adsorbed and scattered both sunlight and moisture) and only later atmospheric circulation dispersed the ash in such a way that the cooling effect, as seen following modern eruptions, prevailed. This is also explored in the book.

In the end one thing is certain – the title of the book could easily be Planet on Fire, rather than Island on Fire, as the two authors take the reader, starting from Iceland, on a great journey around the globe, showing how different civilizations through centuries were, and still are, influenced by volcanoes. I can only recommend this book to geology- and history-enthusiasts alike.

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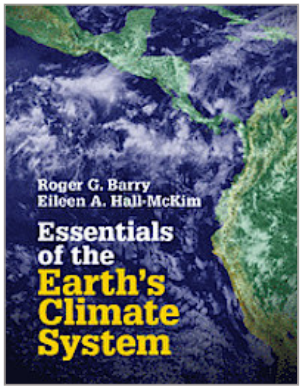
Book review: Essentials of the Earth's Climate System



By Roger G. Barry and Eileen A. Hall-McKim

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Understanding the Earth's climate system is a fundamental part of any atmospheric or Earth science curriculum. When talking about climate, it is important to remember that climate science incorporates the description of key variables and concepts, climatic zones as well as climate change and its implications to society.

Essentials of the Earth's Climate System, by Roger G. Barry and Eileen A. Hall-McKim, is a comprehensive introductory textbook that covers all aspects of the climate system. It is specifically written for a one-semester course in climate science and does not assume prior knowledge beyond a basic understanding of scientific principles. Mathematical equations are mostly omitted in favour of a combination of descriptive texts and colour figures that illustrate most concepts.

Designed for coursework, each chapter starts with an outline of the key concepts and finishes with a brief summary as well as review questions. While most questions require the student to explain a specific process or highlight important aspects, there are also questions that encourage students to work with freely available climate data and to explore climate phenomena. The text itself is divided into short sections, each covering one concept, variable or aspect of climate. These paragraphs are densely packed with facts, scientific theory and applications, but remain easy to read due to the accessible language. Even experienced scientists will find new and relevant information in this book, so that it might serve as a short reference. Throughout the book there are a multitude of text boxes that provide additional information about important scientists or interesting climate features and events such as the Tibetan Plateau or the Dust Bowl. This encourages students to do further reading.

The book contains 12 chapters that can be grouped into four sections. After a brief introduction, chapters two and three introduce climate variables such as energy, moisture and wind. Chapters four to eight, introduce the reader to processes and elements of the climate system, such as microclimates, general circulation, teleconnections, synoptic climatology and land-sea interactions. Chapter nine gives an overview over different climate types and gives examples of the differences within each climatic zone. The last three chapters deal with past and future climates, as well as current applications and implications of climate science. The book also contains an extensive glossary of terms used in the book and links to climate and weather data. There is also as additional information on topics such as monsoons or teleconnections.

To give the reader an impression of the general style of this book, I provide two examples of how topics are covered. The concept of evaporation is addressed on four and a half pages. After a brief introduction to the concept and latent heat, the book provides some history on the work of Penman and modifications of the equations named in his honour, without actually providing the equations, and introduces direct measurement methods, linking them to the FLUXNET network. Then evapotranspiration is introduced and linked to climate classification. The authors provide global maps of evaporation and introduce the concepts of water balance, drought and moisture indices.

The section on monsoons as a climate type establishes the seasonal nature of monsoonal climates and extensively links the upper air circulation over Eastern Asia to rainfall characteristics in the region. Similarly monsoon systems in West Africa, Australia and even North and South America are described.

Compared to other climatology textbooks, the authors present a lot of information that goes beyond the explanation of basic scientific concepts, such as historic overviews and current applications. Additionally, climate classification is treated more extensively than in many other books. It is my impression that the focus of the book is