

The Relative Mountains of Earth:

The Ribus

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2024

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A Pedantic Press publication

PPB005

First published in Great Britain in 2024 by Pedantic Press

pedantic.org.uk

ISBN 978-1-9163662-3-7

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Peak distribution maps reproduced courtesy of Adam Schneider via the GPS Visualizer website, with background images from Esri ArcGIS. Maps also created with QGIS using the Here Satellite layer.

Front cover: Gunung Merapi and Gunung Merbabu as seen from Gunung Lawu in Java, Indonesia at dusk, 2009

Back cover: Pointe Percée, France by Alastair Govan, 2023

The concept

A Ribu is a mountain with one thousand metres of topographic prominence. This book lists all of them. They are the 7150 most prominent peaks on our planet.

Topographic prominence – also known as drop, or relative height – is an objective way of identifying separate, individual mountains. A point on a Himalayan ridge over 6000 metres above sea level may be very impressive, but if it is near another peak 6500 metres high then the 6000-metre peak becomes less important in the landscape, and the views from it are likely to be limited by its higher neighbour. Contrast this example with a 1200-metre peak in Australia with no higher neighbouring peak for hundreds of kilometres. If the view at the top is not obstructed by vegetation then it is likely to offer an incredible panorama over the lower lands, stretching further than the eye can see in all directions.

To take a specific example, the south summit of Mount Everest is 8749 metres high and is arguably the second-highest peak in the world, yet it has a prominence of only eleven metres, and that is why it is not included in the list of 8000-metre peaks. Those who pass over this summit tend to have their eyes firmly fixed on Everest itself. The south summit is merely part of Everest and does not qualify as a separate mountain either objectively or subjectively. Owing to its lack of prominence, it is barely regarded as a distinct entity.

All lists of hills or mountains group them together in a particular category, whether that be region, country, elevation, prominence or a combination of several factors. The use of prominence has taken time to become established but has proved to be a robust and consistent principle for producing lists of peaks. It eliminates subjective judgements based on appearances, routes, personal experiences, favouritism and emotional associations.

The project

The concept for the Ribus owes much to previous summit lists including Corbetts, Marilyns and Ultras, which are looked at in more detail later. The Ribus project began life in Java in Indonesia in 2009, when I met Andy Dean on a hike up Gunung Lawu (3265m). The image on the front cover of this book is from that very hike. We got together again a few weeks later on Gunung Salak (2211m) in West Java and decided to create a list and website detailing the many mountains and volcanoes of the Indonesian archipelago, along with information about how to climb them. I suggested the thousand-metre prominence definition required for inclusion in the list, and Andy immediately responded with the name Ribu for these peaks, which comes from the Indonesian and Malay word for thousand. The Gunung Bagging website was launched a few weeks later with an afternoon event at the Eastern Promise bar in Kemang, South Jakarta.

'Hiking Gunung Rinjani a few months after arriving in Indonesia, I was frustrated by the lack of a good write-up of the routes and options. It was all about selling tour packages. I wanted impartial hike planning advice and GPS tracks. I saved my tracks and was thinking about a website or blog on climbing Indonesia's mountains. The next hike was a Java Lava hiking group trip to Gunung Lawu. Chatting with Dan early on the ascent, he introduced the idea of a list of prominent mountains and soon afterwards the concept of the Ribu and gunungbagging.com were born.' Andy M Dean

A decade later, discussions on an online forum led to an international research team forming with the aim of identifying all of the summits across the globe with one thousand metres of prominence. They were to be known as Ribus or P1000s, where P stands for prominence. The question of what definition to use for any list of summits depends on the scope of the project. A list of Ribus in England or the Netherlands would have no entries at all. A global list of peaks with 100 metres of prominence would have over 1.6 million entries. A figure of 1000 metres seemed to make good sense in Indonesia back in 2009, as any higher prominence led to some great peaks being left out of the list, and anything lower meant including a large number of obscure summits of little mountaineering interest. It was a good fit for the region and 1000 is a nice round number. It was much later discovered that a list of 7150 peaks worldwide can just about fit in a single printed volume.

A good starting point for the project was the list of Ultras, which are peaks with 1500 metres of topographic prominence, also known as P1500s. There are currently believed to be 1566 of them. This list was compiled in 2004-2006 and was already available, via the Peaklist.org website. One of the research team, Oscar Argudo, designed a web application that allowed editors to analyse individual peaks in conjunction with various data sources and to amend a central database. The Ribus project has taken around five years to reach a point where the list is considered to be good enough for publication. There will inevitably be many changes to the list still to come, as data sources are refined, new technology emerges, more appropriate local names are discovered and the mountains themselves change over time due to natural processes. There is more on this topic later in the book.

The mountains

Plenty of mountains are technically illegal to climb, for many different reasons including local religious or superstitious beliefs, hostile landowners, volcanic activity or political rules and administrative regulations. The list of Ribus is not influenced in any way by local access issues, because religions, nations, rulers and landowners tend to come and go more frequently than the mountains themselves. Inclusion on the list is solely determined by a single criterion, that the mountain has been found to have at least 1000 metres of topographic prominence.

The main purpose of the Ribus project has been to create a catalogue not a challenge. No-one is ever going to climb all the Ribus. Even climbing the 1566 Ultras would be an immense undertaking that may well be impossible over the course of a single lifetime. Even before putting one foot in front of the other on the mountains you would need more disposable income and free time than most people could ever dream of having. It would be as much a financial and logistical challenge as a physical one, regardless of ethical considerations. Yet the list of Ribus is more accessible to more people than the Ultras. For example, British residents would have to travel to France or Norway to climb their closest Ultra, whereas there are three Ribus in Great Britain and one over in Ireland. There is also one Sub-Ribu, the brilliant Sgurr Alasdair (992m) on the Scottish island of Skye.

Sub-Ribus are peaks that just miss out on the main list by ten metres or less, with a prominence of from 990 to 999.9 metres. A list of them is included towards the back of the book, because some of them may turn out to be Ribus when improved data becomes available. This publication will certainly not be the end of the story.

Ground zero

The Earth is not a perfect sphere. It bulges at the equator. This explains why Volcán Chimborazo in Ecuador is the mountain summit farthest from the centre of the Earth (6384.4 kilometres away) rather than Mount Everest (6382.3 kilometres away), though Everest is over 2500 metres higher (above sea level) than Chimborazo. Everest is located at 28 degrees north of the equator, which is over 3000 kilometres from the equatorial bulge. As a result of the bulge, Everest is not in the top ten summits farthest from the centre of the Earth.

The sea is not perfectly flat. Sea level varies according to regional differences in gravity. Many national or regional topographic maps use a locally-derived sea level. Mean Sea Level (MSL) is usually based on hourly readings over a nineteen-year period and constitutes zero elevation locally. Vertical datums differ from one another, meaning that zero elevation in Australia is different from zero elevation in Sweden. The World Geodetic System 1984 (WGS84) is a global standard in cartography and satellite navigation yet it does not align perfectly with Mean Sea Level. One great advantage of using topographic prominence is that most Ribus are not affected by any change in sea level. Only the highest points of islands and continents have a key col of zero, which is sea level.

To date there is no perfect model which accounts for the complexity of the Earth's shape, regional differences, the spinning of the planet and a constantly varying actual sea level. It is thought that if the planet stopped spinning then its oceans would split into two separate polar seas, leaving the equator completely dry. This would have massive implications for the list of Ribus but would have even bigger implications for life on Earth.

Data sources

Establishing the prominence of a mountain requires four crucial pieces of information: the location and elevation of its summit and the location and elevation of its key col. This is the specific point that separates a peak from its nearest higher neighbour. If the peak is the highest point of an island then the key col is sea level. Creating a list of peaks based on this data also requires establishing a name for the peak, which is a less precise process.

The dataset for the Ribus has been compiled from a wide range of sources with varying levels of accuracy. Different sources often provide different information, and it has been the task of editors on the Ribus project to scrutinise all of the accessible sources and use their best judgement. Some parts of the world have been so well surveyed and mapped that accurate elevation and prominence figures can be given to within tens of centimetres. Other regions are not so nearly well surveyed.

Data sources have included traditional topographic paper maps, online digital map layers such as OpenTopoMap and the Google Maps terrain layer, personal GPS readings from hikers and numerous online sources of mountain information such as the Peakbagger.com website. However, the single most important factor in making the project feasible has been the availability of global digital elevation models (DEMs), which are elevation datasets representing terrain that can be visualized and analysed. These DEMs have made it feasible to compile lists of peaks worldwide with a reasonable degree of accuracy. The results produced are not usually as accurate as those from ground surveys or satellite GPS based surveys, but the completeness and consistency of coverage has made these models an invaluable resource.

Locating the key col for every peak with a high degree of accuracy would have been an immense challenge if it had not been for the work of three pioneering individuals: Edward Earl, Jonathan de Ferranti and Andrew Kirmse. In the early 2000s, Edward Earl created a computer program called WinProm which was used to calculate prominence values based on raw terrain data. It was a remarkable achievement. Jonathan de Ferranti created a DEM terrain dataset that was the ideal companion to use in conjunction with the WinProm program, and Andrew Kirmse used these to produce his global datasets.

Kirmse was previously engineering director and terrain database specialist for Google Earth and Google Maps. He released two datasets – in 2017 and 2023 – covering the entire planet and including all peaks down to a prominence of 100 feet. This was another huge achievement. The 2017 dataset was used as the starting point for the Ribus project in 2019, along with an earlier provisional list provided by Edward Earl. Team members carried out manual research into all individual peaks, and this was later cross-checked with the 2023 dataset. More details on the research process are given later.

Tragically, Edward Earl died in 2015 during a hiking trip to Mount Isto, which is coincidentally the first mountain listed in this book.



Mount Everest, the most prominent peak on Earth (Oscar Argudo)