

Active Volcanoes of the World

Ulrich Kueppers  
Christoph Beier *Editors*

# Volcanoes of the Azores

Revealing the Geological Secrets of the Central  
Northern Atlantic Islands

 Springer

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# **Active Volcanoes of the World**

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## Foreword

The Northern Mid-Atlantic Ridge (MAR) between 33°N and 41°N exhibits a gradient in seafloor depth, from 3500 m just north of the Hayes Transform (near 33°N) to less than 1000 m near 39°N. Together with this depth gradient, the MAR is characterized by a broadening with a funnel shape, best represented by the 2000 m bathymetric contour. This large bathymetric structure representing a prominent submarine topographic high is called the Azores platform. The maximum bathymetric expression of this platform is given by the emergence of a group of nine volcanic islands, forming the Azores archipelago.

The Azores platform represents a tectonic peculiarity as it is located at the triple junction between the American, Eurasian and African plates. In this context, the tectonic evolution of this region and the nature of the boundary between the Eurasian and African plates have always been contentious, with several models proposed to describe the overall plate kinematics, but this issue is still being debated.

Another highly disputed subject is related to the origin of the Azores platform and its islands. The geochemistry of the Azores lavas (either from land or from submarine samples) shows incompatible trace element enrichment coupled with high Sr–Nd–Pb radiogenic isotope ratios (a typical signature of oceanic island basalts) and has been used to suggest the existence of a compositional mantle anomaly beneath the Azores. Additionally, this geochemical enrichment was found to correlate with other geophysical characteristics, such as negative gravity anomaly, anomalously low S-wave velocities in the 100–200 km depth range or crustal thickness 60% higher than normal, all of them suggesting high magma productivity. These observations and inferences led to the generation of alternative models by suggesting the existence of a thermal anomaly in the mantle (“hotspot”), a volatile enrichment anomaly (“wetspot”) or the presence of a mantle plume. To date, origin, size, depth and accurate location of this mantle anomaly are still a matter of debate.

The chapters included in this book provide a comprehensive and multidisciplinary overview of the geoscientific knowledge of the Azores platform. The scientific core themes of this volume encompass the geophysical, geochemical and petrological subjects, addressing not only the two aforementioned main controversial issues in the Azores, but also related topics such as hydrogeology and palaeontology. Additionally, Chapter “[A Portrait of the](#)

[Azores: From Natural Forces to Cultural Identity](#)” by Beier and Kramer deals with the Azorean cultural identity that has been strongly conditioned by the forces of nature, expressed in this region mainly by earthquakes and volcanic eruptions. Since the first permanent settlements in the Azores in the fifteenth century, about thirty volcanic eruptions, both on land and offshore, have been documented. Besides, the Azores are located in an area of elevated seismic activity. The majority is usually expressed through microearthquakes; however, periodically, the Azores are shaken by moderate to strong earthquakes that have caused destruction and negative economic impact. Cumulatively, more than 5000 people have perished and this, undoubtedly, impacted on the socio-economic and cultural development of these Portuguese people living isolated and enclosed by volcanoes in the middle of the Atlantic Ocean.

The six following chapters constitute the geophysics section in this book. The second Chapter [“The “Azores Geosyncline” and Plate Tectonics: Research History, Synthesis, and Unsolved Puzzles](#)” by Vogt and Jung addresses the anomalous morphological, geological and geophysical framework present in the so-called Azores Triple Junction. It integrates and compares these characteristics with those present in a broader and more regional context such as the encompassing Mid-Atlantic Ridge, in a way to clearly understand the peculiarities existent in the Azores. These anomalies are identified through water depth and gravity/geoid variation, crustal thickness, upper mantle seismic structure, plate boundary morphology and rock geochemistry. The authors also review the evolution of the present-day understanding of the Azores and discuss the implications of their findings for other geologically recent plate boundaries. Chapter [“The Contribution of Space-Geodetic Techniques to the Understanding of the Present-Day Geodynamics of the Azores Triple Junction](#)” by Fernandes et al. focuses on the major contributions obtained with Space Geodesy (Global Navigation Satellite Systems (GNSS) and Interferometry Synthetic Aperture Radar (InSAR) techniques) in the Azores through a review of the published results since the late 1980s. Global Navigation Satellite Systems (GNSS) have been applied to modelling and understanding large-scale processes such as the relative movements and angular velocities of the three tectonic plates but, more recently and as a result of denser distribution of GNSS stations throughout most Azorean islands, more detailed studies concerning intra-island deformations have been carried out. Both techniques addressed have been contributing significantly to better understand the tectonic dynamics and the volcanic processes occurring in the Azores. In Chapter [“Crust and Mantle Structure Beneath the Azores Hotspot—Evidence from Geophysics](#)”, O’Neill and Sigloch assess the geophysical constraints on crustal and mantle structure beneath the Azores hotspot discussing the possible existence of a traditional mantle plume. The data obtained through surface wave models, suggesting a shallow origin (250–300 km of the mantle) to the Azores hotspot or, alternatively, that the plume is waning, contrast with recent finite-frequency body-wave tomography which indicates that the Azores plume may extend to the core–mantle boundary. The authors suggest a common origin under West Africa for the Azores, Canary and Cape Verde hotspots. Chapter [“The Tectonic Evolution of the Azores Based on](#)

[Magnetic Data](#)” by Miranda et al. reviews the progress made in the geophysical research of the Azores, based on geophysical observations complemented by numerical modelling, and presents an updated interpretation scheme for the genesis and evolution of the Azores Triple Junction. Whereas on land investigations with detailed topographic maps, aerial photographs and satellite imagery as well as rock samples are straightforward and allow the study of geological structures at all scales, at sea things are quite different and have only advanced recently with technological developments. Mitchell et al. (Chapter [“Volcanism in the Azores: A Marine Geophysical Perspective”](#)) present and discuss the Azores sea bottom morphology obtained through different types of sonar data (GLORIA, TOBI and multibeam bathymetric data). The studied sonar datasets allowed them to view and understand the topographic structures of the ridges (that constitute important extrusive structures in the Azores region) and interpret the morphologies in terms of the volcanic and tectonic features present on them. Fontiela et al. (Chapter [“Characterisation of Seismicity of the Azores Archipelago: An Overview of Historical Events and a Detailed Analysis for the Period 2000–2012”](#)) give an overview of the existing historical and instrumental seismic catalogues, describe the seismicity of the region since early 1915 and analyse the features of the observed seismicity in the period 2000–2012, which is typically characterized by high number of events with relatively low magnitude.

Chapters [“The Marine Fossil Record at Santa Maria Island \(Azores\)”](#) and [“Surface and Groundwater in Volcanic Islands: Water from Azores Islands”](#) deal with direct observations or measurements. Ávila et al. (Chapter [“The Marine Fossil Record at Santa Maria Island \(Azores\)”](#)) describe the unique exposure of sedimentary rocks containing marine fossils in the Azores. These outcrops on Santa Maria Island are interpreted as the result of tectonic processes. The authors also discuss the need and importance of preserving this palaeontological heritage. The magmatic origin of the Azores is first approached by Larrea et al. (Chapter [“Petrology of the Azores Islands”](#)) with a detailed compilation of mineralogy and major element chemistry of xenoliths and volcanic rocks. These geochemical data are used to give an overview of the petrology of these igneous rocks, namely insights into magmatic evolution paths/processes and depth of melting, in a geochronological context (where appropriate temporal data are available), to better understand the origin of the specific geochemical characteristics present in each island. In Chapter [“Melting and Mantle Sources in the Azores”](#), Beier et al. detail the geochemistry of igneous rocks (mainly from land but also including submarine samples) by reviewing the trace element and radiogenic isotope (Sr–Nd–Pb–Hf systems) data. The alkaline character of the lavas and the large compositional range from basalts to trachytes identified in the volcanoes is emphasized, and elemental and isotopic comparisons inter-islands are made. These findings are used to address the mantle source characteristics (composition, degree of heterogeneity and temporal evolution) of the magmas from the Azores islands as well as their chemical evolution and the processes involved during magma ascent and differentiation. The geochemistry study is complemented by Moreira et al. (Chapter [“Noble Gas Constraints on the Origin of the Azores Hotspot”](#)) which discuss the origin



of the Azores archipelago by making comparisons between the different islands and integrating the findings in a wider regional scheme along the MAR between 28°N and 53°N. Antunes and Carvalho (Chapter “[Surface and Groundwater in Volcanic Islands: Water from Azores Islands](#)”) characterized surface waters (lakes, springs and rivers) and revealed the degree of direct input by volcanic activity. The authors constrained by the volcano-tectonic activity that influenced today’s geomorphological characteristics and emphasize the importance of volcanic lakes as a freshwater resource.

The final Chapter “[Where to Go? A selection and Short Description of Geological Highlights in the Azores](#)” by Kueppers et al. describes a selection of geological outcrops from each of the Azores islands that the authors considered worthwhile visiting, to get an overview of prominent geological features. Some of the selected outcrops have been subject to detailed geological descriptions and are regularly visited by researchers and students, and data from the peer-reviewed literature, wherever available, are used to complement the descriptions and integrate them in a larger regional geological context.

I am happy to see such a compilation of national and international chapters that cover a wide range of geoscientific questions about the Azores.

Alfragide, Portugal

Pedro José Lopes Tavares Ferreira  
LNEG—Laboratório Nacional de  
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## Acknowledgements

The editors Ulrich Kueppers and Christoph Beier acknowledge Springer and in particular Johanna Schwarz and Annett Buettner as well as the series editors Corrado Cimarelli and Sebastian Müller for their invaluable and patient help during the difficult and even rocky way through science and politics. The topical structure has in part been developed by Ulrich Kueppers and José Pacheco (Instituto de Investigação em Vulcanologia e Avaliação de Riscos, IVAR). Ulrich Kueppers and Christoph Beier finalized the structure and worked hard—sometimes effortlessly—towards this book. Christoph Beier acknowledges help and support by Jim McEwan, Simon Coughlin, Mark Reynier and Adam Hannett. Both editors have learned that the compilation and handling of such a complex and large topic is subject to both scientific and political discussions. Both editors take this opportunity to thank all authors of this volume as well as the reviewers for their valuable contributions and also thank the Deutsche Forschungsgemeinschaft (DFG) and the Bundesministerium für Bildung und Forschung (BMBF) for support of the RV Meteor cruise M128 to the Azores Plateau during which we could expand our scientific knowledge of this unique island group.

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# Introduction

Ulrich Kueppers and Christoph Beier

The archipelago of the Azores comprises nine inhabited islands and is an autonomous region of Portugal. It stretches more than 600 km in an E–W direction and is separated by the Mid-Atlantic Ridge (MAR). Two of the islands (Flores and Corvo, the Western Group) are situated on the American plate while the seven eastern islands of the Central (Faial, Graciosa, Pico, Terceira and São Jorge) and Eastern Groups (Santa Maria and São Miguel) are located on (sub-)parallel transform faults extending eastwards from the MAR that define the complex plate boundary between Eurasia and Africa (see Vogt and Jung, Chapter “The “Azores Geosyndrome” and Plate Tectonics: Research History, Synthesis, and Unsolved Puzzles”).

Volcanism started at different times for these islands, manifested by significantly different ages constrained for the oldest rocks of individual islands (Santa Maria 8 my, Pico 0.25 my). Since the earliest permanent settlements in the 15th century, approx. 30 volcanic eruptions have taken place in the archipelago, half of which

from subaerial vents. Important examples took place on Faial (1672 and 1957/8), Pico (1562, 1718, 1720), São Jorge (1580 and 1808), São Miguel (1563/4 and 1652) and Terceira (1761). In submarine settings, eruptions repeatedly produced new islands, most of which were eroded within few weeks or months, as e.g. at the Banco D. João do Castro (1720) or the Ilha Sabrina (1811). As of today, Corvo, Flores, Graciosa and Santa Maria are considered extinct while some volcanic center on the other islands are considered dormant. The last confirmed eruption took place between 1998 and 2001 at a water depth of 200–300 m, few kilometres off the Western tip of Terceira. Today, all islands are monitored in detail for indications of tectonic but more importantly magmatic activity by the *Centro de Informação e Vigilância Sismovulcânica dos Açores* (<http://www.cvarg.azores.gov.pt/civisa/Paginas/homeCIVISA.aspx>).

The book aims at presenting a comprehensive view of the Azores geology, reviewing the scientific literature of past decades. We do not aim at covering the entire geological history and knowledge of the archipelago for which the reader is referred to the individual peer-reviewed publications in detail in each respective chapter. It rather covers a wide range of geological subjects that have been addressed on these islands in the past and for which these islands are famous. This book addresses the fields of Geochemistry, Geology, Geophysics, Palaeontology, Petrology and Volcanology, Chapters “The “Azores

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Geosyndrome” and Plate Tectonics: Research History, Synthesis, and Unsolved Puzzles”–“Surface and Groundwater in Volcanic Islands: Water from the Azores Islands”. We have also added a chapter on interesting outcrops (see Kueppers et al., Chapter “Where to Go? A Selection and Short Description of Geological Highlights in the Azores”) which will be of interest to those readers travelling to the Azores, accompanied by a chapter addressing the social and linguistic evolution within the Azores (see Chapter by Beier and Kramer, Chapter “A Portrait of the Azores: From Natural Forces to Cultural Identity”).

The impact of volcanism on the formation of the Azores, on their geological and biological evolution and on the socio-economic development of the islands is unique amongst the world’s volcanoes due to the isolated positioning in the Atlantic albeit close connection to mainland Portugal and the United States and certainly will remain a topic of intense scientific debates in the future as much as is has been in the past. All this has made all of the Azores islands a worthwhile destination for both holiday and work trips which both of the editors and many of the authors of this volume have experienced or are experiencing during finalizing their manuscripts.

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# A Portrait of the Azores: From Natural Forces to Cultural Identity

Rudolf Beier and Johannes Kramer

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## Abstract

A comprehensive description of Azorean cultural identity does not exist, and would certainly deserve thorough investigation on the islands themselves and a monograph of its own. What we can do here is to take a look at some single landmarks of this unmapped territory, selected mainly from the perspective of how people live with the forces of nature. How do people deal with them, and how are these forces mirrored in their behaviour, beliefs, rituals, and symbolic and imaginative expressions? Is there an Azorean culture? Before we address this question, presenting some evidence from emigration, religion, and literature, we will provide some historical and economic background.

---

## 1 Prologue: Once upon a Time...

*Once upon a time in the lost kingdom of Atlantis there ruled a king whose name was Graywhite. He had married the beautiful Queen Rosewhite. They lived in a magnificent palace, but it was a sad place because there were no little children in it...*

This is the beginning of the folk tale about the origin of the Azores, entitled *Princess Bluegreen of the seven cities* (Eells 1922/2011, 17ff.). In the course of the story, the king and the queen are visited by a fairy who promises them that a princess would be born, but only if they agreed that the princess would be withheld from them for twenty years, to give the King the chance to make up for his cruel behaviour towards his subjects. They agree, but in the end the King becomes impatient and breaks the vow after eighteen years, trying to free Princess Bluegreen by force. And here is the ‘geological ending’ of the tale:

*... King Graywhite marched on and on. It was a long and perilous journey and the army suffered many hardships on the way. It seemed as if they would never arrive, but at last they drew near to what everybody knew to be the most beautiful part of the whole kingdom, where the fairy had taken the Princess Bluegreen to conceal her. Storms raged; lightning flashed; ominous roarings and rumblings sounded from the depths of the earth. ... “On! On!” cried the king. “Do you think I would abandon this expedition now?” The words were hardly out of his mouth when a huge rock fell from its place near where he stood and rushed away down the mountainside. The earth trembled*

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*violently beneath their feet. Fearful rumblings and roarings sounded all about them. ... King Gray-white struck his royal sword against the great wall. At that moment the walls fell. The earth beneath their feet rose. Great flames swept up towards the sky and rushed over the land, sweeping everything before them. Then the sea raged over the earth in violence until it had covered the whole kingdom of Atlantis. The fairy's curse had been fulfilled. The king was dead. His kingdom was consumed by fire.*

*When at last the waters grew calm again all that remained of the great rich kingdom of Atlantis was the group of nine rocky islands which to-day is called the Azores. ...*

We have a storm, a landslide, an earthquake, an eruption, and we have a tsunami. This, as it were, is punishment by the forces of nature ...

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## 2 Historical Outline

Our look into the history of the Azores [based mainly on Goulart (2008), Marques (2001), and Santos (1995)] will present the islands and their inhabitants as torn, in a unique way, for about three centuries, between the powers of Portugal and Spain, and, more recently and more fundamentally, as a bridge connecting Europe and the Americas. Section 2 will mainly deal with the Azores from a political perspective and less with nature and economy (for these, see Sect. 3), while Azorean culture and the influence of natural forces will be the focus of Sect. 4.

### *Mysterious coins and mythical lands*

All regions of Portugal take pride in their Roman origins, with the exception of the Azores: They, in ancient times, were still *terra incognita*. However, in the early days of research, there were attempts to imagine, invent or fabricate connections to antiquity. For example, it was claimed that coins from Carthago (fourth century BC) were found in 1749 on the western island of Corvo. However, they were declared to be fakes as early as 1836 by Alexander von Humboldt,

maybe corresponding to the wishes of local people, but not to historical reality.

Antique and medieval stories and early maps contain many mythical lands and legendary islands, such as Atlantis, Brasil, the Fortunate Islands, or the Isles of Saint Brendan. For these phantom lands, virtually all islands we know in the Atlantic Ocean, including the Azores, have served as possible matches. From a historical perspective, what the old sources tell us about islands west of the *Columns of Hercules* (Gibraltar) can, basically, be considered as literary topoi about unknown worlds and strange creatures, leading us to the realm of dreams and myths. The most common assumption seems to be that there has, up to now, been no convincing evidence that human beings set foot and lived on the islands before they were explored by the Portuguese (e.g. Santos 1995, 3; Wakonigg 2008, 122). There are researchers, however, who try to refute this: Rodrigues et al. (2015) claim to have found evidence of pre-Portuguese presence in the Azores, a man-made rock-basin with engravings produced on Terceira during or before the eleventh century. Apart from this controversy, what we can safely say is: the islands were uninhabited when the Portuguese occupied them, and there must have been some knowledge of them before the Portuguese exploration (see below).

### *Medieval manuscripts and maps*

The actual history of the discovery of the Azores starts at the beginning of the fourteenth century, possibly with the Genoese, but there are vague messages of speculative sightings during ocean exploration dating back to the thirteenth century. We find the oldest available notices about the Azores in the manuscripts of the famous *El libro de conocimiento de todos los reinos* (*The book of knowledge of all kingdoms*, Marino 1999), a kind of geographic encyclopedia, or more precisely, a medieval fictional travel book written by an anonymous author (some say a Spanish

Franciscan, others doubt this). It was composed in the last quarter of the fourteenth century and was based on contemporary portolans (maritime charts) and mappaemundi (special medieval maps of the world, for details Marino 1999, XXVIIIff.). The author mentions the Canary Islands, Madeira, Porto Santo, and eight further islands, which must be the Azores, although most of the names used differ from the ones we know today (Marino 1999, 50): *la Isla del Lobo* (Santa Maria), *la Isla de las Cabras* (São Miguel), *la Isla del Brasil* (Terceira), *la Isla Columbaria* (Pico), *la Isla de la Ventura* (Faial), *la Isla de Sant Jorge* (São Jorge), *la Isla de los Conejos* (Flores), and *la Isla de los Cuervos Marines* (Corvo). Examples of famous contemporary maps, which, well before the Portuguese exploration, showed seven or eight islands and, though in different languages, used strikingly similar names, were the *Medici Atlas* (the *Portulano Medicea Laurenziano*, or *Medici-Laurentian Atlas*, of 1351, for details: Marino 1999; Santos 1995), the *Catalan Atlas* (most probably from 1375, Marino 1999), and *L'atlante Corbitis* (1384–1410). The *Corbitis Atlas* arranges and names eight islands from North to South (see Fig. 1 and *l'atlante nautico 'Corbitis'*): *y de corui marini* (Corvo), *liconiGi* (Flores), *s(an)c(t)ozorzi* (São Jorge), *y la uentura* (Faial), *li colonbi* (Pico), *y de brazil* (Terceira), *caprara* (São Miguel), and *louo* (Santa Maria). It was atlases like these, or possibly their predecessors, that provided the information which *El libro de conocimiento de todos los reinos* was based on (Marino 1999).

### **Henry and the hawks** *Portuguese exploration*

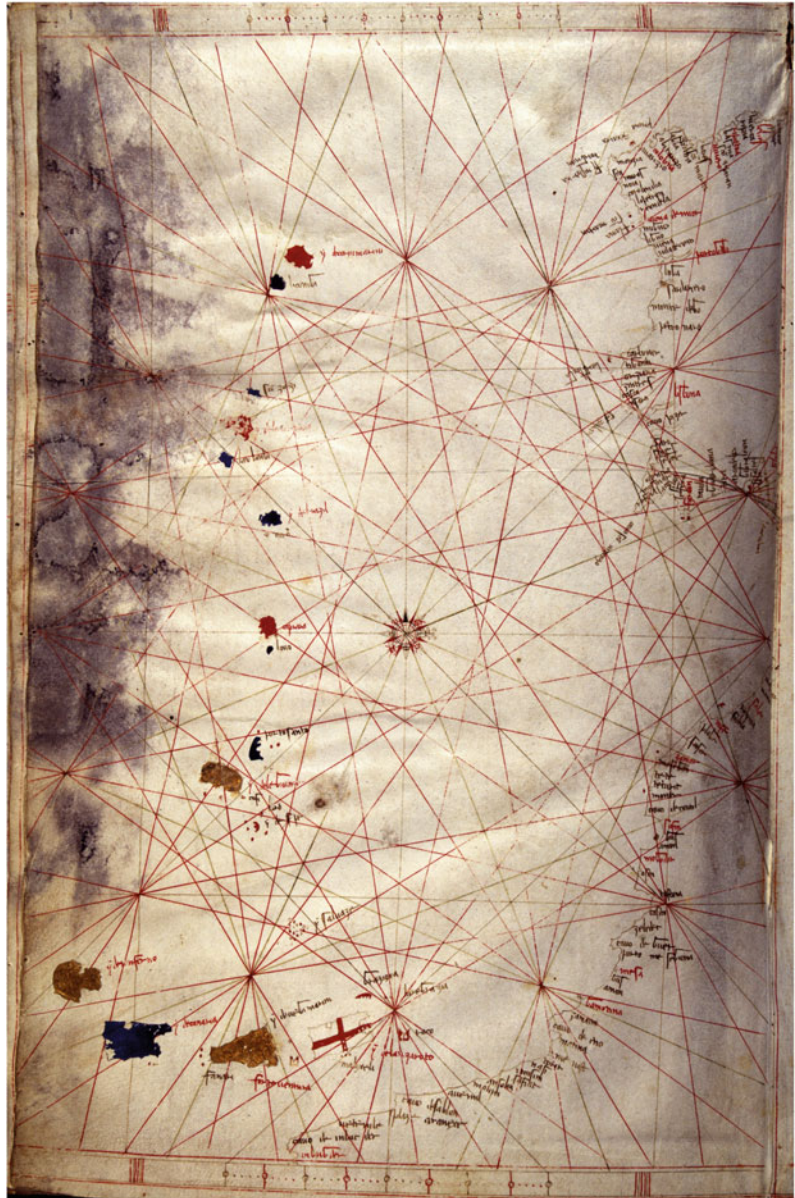
The first comprehensive attempts to describe the islands and to document local Azorean history were made by two Jesuits: Gaspar Frutuoso's (ca. 1522–1591) work *Saudades da terra* (*Longings for the native country*, 1586–1590) was not printed during his lifetime, but in 1873. His friar, António Cordeiro (1641–1722) used Frutuoso's work in his *História insulana das Ilhas a Portugal sugeytas no Oceano Occidental* (*History of*

*Portuguese islands in the Western Ocean*), which was published in Lisbon in 1717. This book is a detailed description of the nine islands, their discovery, places, important people, their nature, including geological observations, e.g. “furnas, fogos, & tremores” (*caves, fires, tremors/quakes*) on São Miguel (Cordeiro 1717, 151). According to Frutuoso and Cordeiro, the discovery of the islands is attributed to Gonçalo Velho Cabral (1400–1460), who in 1431 was sent on a reconnaissance voyage to the West by Prince Infante Dom Henrique, or Henry the Navigator, the leader of the *Holy Order of Christ* and founding father of modern navigation and, as it were, also of the Azores (Santos 1995). On this journey, Cabral only found a series of volcanic rocks (about 25 miles off the nearest ‘Azorean’ island), which he named *Formigas* (*ants*). Today, the *Ilhéus das Formigas* are almost completely submerged (see also Larrea et al., Chapter “[Petrology of the Azores Islands](#)”). During his second journey, on 15 August 1432, the day of the feast of the *Assumption of our Blessed Mother*, or *Santa Maria*, he discovered an island, which he named accordingly, and found suitable for settlement. The second island, on which the Portuguese landed in 1444, was São Miguel. Later on, the seafarers discovered Terceira, the ‘third island’ chosen for settlement, with Gonçalo Velho Cabral as the first administrator, or ‘captain-donatory’. After the Portuguese explorers landed on the central islands of Graciosa, São Jorge, Pico, and Faial, the sighting of the western islands, Flores and Corvo, in 1452, concluded the discovery of the Azores.

Other sources attribute the discovery of the Azores to Portuguese navigators “around the period of 1427 to 1432, probably by Diogo de Silves”, who is said to have found Santa Maria and São Miguel in 1427 (Farjaz 2008, 25; Wakonigg 2008, 122). His biography is obscure, his name is assumed to appear in a chart drawn by a Catalan cartographer in 1439.

The name ‘Azores’, Portuguese *Açores*, is derived from Port. *açor*, Span. *azor* (<Lat. *acceptor*), English *hawk*. The hawk, however, is not a native bird on the islands. It has been assumed that in the discovery phase some other

**Fig. 1** *L'atlante nautico 'Corbitis'*, page 4 (courtesy of Biblioteca Nazionale Marciana di Venezia). *Su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo—Bibliotheca Nazionale Marciana. Divieto di riproduzione.* (By kind permission of Ministero dei Beni e delle Attività Culturali e del Turismo—Bibliotheca Nazionale Marciana. Do not reproduce)



bird (such as a large shearwater, or the Azorean buzzard) was confused with the hawk. Other explanations are quoted by Santos (1995).

### *Sheep and settlers*

The first 'settlers' of the Azores were sheep (and other domestic animals) released in order to provide meat for people still to come. On 4 July

1439, King Adonso V granted permission to settle seven islands: São Miguel and Santa Maria in the east, and the central islands of Terceira, Pico, Faial, São Jorge, and Graciosa. On 8 January 1453, the Portuguese king donated the (still unsettled) island of Corvo to his uncle Afonso de Bragança. In 1456, the first settlers came to Terceira, and up to 1470 the other islands were populated. The first settlers lived in natural

accommodations, in rock caves and improvised dwellings (*cafuas*) protecting them from bad weather and storms.

In addition to the Portuguese immigrants, many Flemings came to settle on the islands. The name of *Horta* on Faial is a corruption of the Flemish name *Joss van Hurtere*, and the islands were also called *Insulae Flandricae* or *Ilhas Flamenga*, which survives in the place name *Flamengos* on the island of Faial.

Apart from Portuguese and Flemish settlers, there were smaller groups of Moorish prisoners, African slaves, and people from Madeira, France, Italy, Scotland, England, Morocco (esp. jews), and Spain (esp. clergymen, Santos 1995).

### **Portugal and Philipp**

Although early Spanish attempts to seize the Azores had failed, the relations between the Portuguese and Castilian kingdoms remained tense. After all, they were competitors in the exploration and acquisition of new territories to be colonized. For Portugal, discoveries helped to assert “its independence and emancipation from Spain” and helped to stabilise Portugal as a nation (Ramos Villar 2006, 16; for sociocultural similarities and differences between Portugal and Spain today, see Hofstede and Hofstede 2005). When in February 1493 Columbus returned from his discovery voyage to America and anchored in the *Baia dos Anjos* on Santa Maria to resupply his ship (the *Niña*) with provisions and water, he was given a hostile reception. However, nowadays the city honours him with a monument, and Christóvão de Aquirar devoted a poem to him entitled *Navigator of the Island Seas* (Almeida and Monteiro 1983, 56ff.).

Nominally, the territorial conflicts between Portugal and Spain were solved by the *Treaty of Tordesillas* (7 June 1494), which was mediated by Pope Alexander VI: It drew a line through the Atlantic from the North to the South Pole; this line ran 370 Spanish miles (1770 km) to the west of the Cape Verde Islands and split the world into a western Spanish half and an eastern Portuguese

half, by awarding everything west of this imaginary line to the Spaniards and everything east of it to the Portuguese. In the European area this arrangement was not valid, but the affiliation of the Canary Islands to Spain and of Madeira and the Azores to Portugal created a kind of temporary balance between the two powers.

As for the whole of Portugal, the year 1580 brought major change for the Azores: On 15 January 1580, the so-called Cardinal-King Henrique I was killed in the Battle of Almeirim in North Africa. He was childless and in his will left his kingdom to the Spanish King Philipp II. The attempt to establish a rival king in Portugal in the person of António of Crato (from an illegitimate line of the royal family of Avis) was quickly thwarted by Spanish troops. In the Azores, however, António’s claims to power were still supported, and it was not until the summer of 1583 that the last resistance was ended by Spanish troops in a bloodbath at Angra.

For the time being, belonging to the Spanish Empire seemed positive for the Azores: Terceira became an important trading centre for the Spanish galleons full of gold, silver, and other treasures from America on their way from the Caribbean to Europe. Admittedly, the power of Spain weakened after the defeat of the armada in August 1588, and especially after the Armada was ultimately defeated and destroyed by the Dutch in the Battle of Gibraltar on 25 April 1607. Afterwards, English privateers took the chance to plunder the single islands of the Azores, which individually were hard to defend.

During the sixty years of Spanish government, the foreign rule became more and more unpopular in Portugal, as it became increasingly obvious that all profits were diverted to Madrid. Thus, it is not surprising that when in Portugal the revolution of the nobility led to the installation of João IV from the house of Bragança as King of Portugal, this met with strong sympathies in the Azores. Still, it lasted until 4 March 1642, before the Spanish occupation of the Castelo de São João Baptista on Monte Brasil in the outskirts of Angra ended.

## *Maria and Miguel*

### *The French and the British, the liberals and the absolutists*

The riots of the French Revolution affected Portugal, but had no direct and immediate impact on the Azores: Portugal remained loyal to its traditional ally Great Britain, and did not join the anti-British alliance. In 1806 King João VI refused to follow the Continental System ordered by Napoleon to stop all trade between Europe and Great Britain. In the *Peace of Fontainebleau* (27 October 1807) Spain offered the French troops the right to march through to Portugal. The French general Jean-Andoche Junot occupied the whole of Portugal, but on 29 November 1807, just before French troops occupied Lisbon, the royal family, under the protection of the British fleet, escaped to Brazil, where they remained until their return to Portugal in 1821. In Portugal, there was a liberation struggle against the French occupants, supported by the later Duke of Wellington, and finally the troops had to leave (*Peace of Sintra*, 30 August 1810). From 1810 to 1820, Portugal was *de facto* occupied by British troops.

During this turbulent period, the connections between the Azores and Portugal were interrupted, with the British fleet securing the intactness of the islands from external enemies. Brazil became an independent empire in 1822 under emperor João I, who at the same time was King João VI of Portugal. When he died in 1826, his son Pedro I, the rightful successor, and since 1822 Emperor of Brazil, abdicated the Portuguese throne to his eldest daughter, Maria (Maria II, *Maria da Glória*), who at that time was seven years old. Nevertheless, his exiled and absolutist-minded brother Miguel laid claim to the Portuguese throne. In a coup d'état he deposed Maria and proclaimed himself King. Miguel abolished the first Portuguese constitution, which had been passed by the Cortes of 1822 and to which João IV had already sworn allegiance.

During this struggle of liberal versus absolutist forces in Portugal, the Azores entered the

stage as an important political agent: The liberals of Terceira removed the *Capitão geral* loyal to Miguel, and replaced him by a follower of the young queen. On Terceira, a *Junta provisória* was proclaimed, and Angra was proclaimed the capital of Portugal. The so-called *Regencia de Angra* (1828–1832) beat off all attacks of Miguel's followers and won the Battle of Praia on 11 August 1829, which put the Portuguese fleet out of action. In 1831, all islands were in the possession of the liberals, and Pedro I arrived on 22 February 1832 in Ponta Delgada on São Miguel, driving Miguel's troops out of the country. After the important role the Azores had played in the power struggle between Pedro and Miguel, queen Maria da Glória honoured Angra by giving it the name *Angra do Heroísmo* in 1837.

## *Captains and captaincies*

### *Azorean administration*

The internal administration of the islands was based on the division into *Capitanias* (*captaincies*), as part of the *Captain-Donatory* system introduced by Henry the Navigator, allowing absentee landowners to control their property and receive payments from the peasant tenants. Apart from other privileges, the *capitão*, a hereditary post, and the *donatórios* (*donatories*) had the monopoly on all mill products, salt and bread, and granted land for tenant farming. This feudal heritage of tenant farming must be considered a major reason for Azorean emigration (Almeida 1980; Santos 1995, see below).

In 1766, Azorean administration was centralised: The *Capitanias* of the single islands were subordinated under the *Capitania Geral*, placed in Angra do Heroísmo on Terceira, which was declared the capital of the Azores. This general captainship had significant functions, it concentrated all administrative, military, and judicial power, managed local economic life, and controlled the regional governors of the single islands.

The *Capitania Geral dos Açores* was abolished in 1832 in favour of a *Provincia dos*

*Açores* with Angra as capital, but little later (in 1833), motivated by the displeasure of the inhabitants of São Miguel to be subordinate to Terceira, the new province was split into two, the *Provincia Oriental dos Açores* with Ponta Delgada on São Miguel as capital and the *Provincia Occidental dos Açores* with the capital Angra de Heroísmo on Terceira.

### ***Resupplying, refuelling, relaying***

#### *Ships, planes, and cables*

Throughout their history, the Azores repeatedly served, for certain periods of time, as an essential strategic place linking Europe and America via ship, plane, or cable. These connected the islands more closely to the world, until technological innovation reduced their importance as a base of support or refuelling or telecommunications. “Between these transitory intervals of keeping pace with the world, the islands endured, in silence and quietude ...” (Almeida 1983, 20).

The Azores were an ideal trading station and a place to resupply ships. During Spanish occupation, they served as a port of call for their galleons. Since the thirties of the nineteenth century, American ships were seen more frequently in the rich whaling grounds around the islands, and they often landed to stock up on provisions or to be repaired. The British warship *HMS Styx*, under captain Alexander Thomas Emeric Vidal, carried out surveys of the Azores (1841–1845), on which the drawing of the first reliable map of the Azores was based.

For steamships, the Azores became an important stopover in transatlantic trade. Angra de Heroísmo, Horta and Ponta Delgada developed into important ports, although the importance of the Azores for ship traffic diminished again from the last third of the nineteenth century onwards, with the shift of traffic to the northern part of the Atlantic. For some time, planes between the continents needed the Azores for refuelling. Technological progress made the stopover obsolete in the mid sixties, and put an end to still another opportunity Azoreans, temporarily, had profited from.

With the development of telegraphy, the Azores became a major transfer station. In 1893, a first cable was installed between Horta on Faial and Carcavelos near Lisbon, soon followed by the connection with US stations. In 1900, Horta became the seat of the American *Cable Company* (CCA), of the British *Europe and Azores Telegraph Company* (EAT) and of the German *Deutsch-Atlantische Telegraphengesellschaft* (DAT), which linked Horta to Borkum. The latter had to cease its operations in 1916, but could re-establish its activities in 1926 until the final end of the Company in 1943. The buildings of the so-called *Colónia Alemã*, where the twenty members of the DAT lived with their families, can still be visited. In the course of time, several cables were destroyed or burned due to volcanic and seismic incidents, esp. submarine eruptions, and had to be repaired, or parts of them had to be replaced entirely (Farjaz 2008). The end of the boom of telegraphy in Horta came in the fifties, when relay stations were made obsolete by the higher capacity of cables, stronger amplifiers, the increasing use of radio, and later of satellites. In 1969, the British closed down the last cable station in Horta.

We would like to point out, however, that it was not only by virtue of technological advances that the Azores linked the Old and the New Worlds. Above all, the connection has been established and fostered by people, i.e. by thousands of migrants (see Sect. 4.2 below). One outstanding builder of bridges and cultural negotiator in the field of literature is Almeida (e.g., 2006).

### ***Capelinhos and Carnations***

#### *The Azores in the twentieth century*

Politically, the beginning of the twentieth century brought the last years of the Portuguese monarchy, which were characterized by riots and a lack of necessary reforms. The proclamation of the Republic, on 5 October 1910, did not improve this situation: the urgently needed agricultural reform remained unfinished, and social unrest continued to rock the country.



In 1916, Portugal entered into the First World War because of the German submarine menace. Some Portuguese merchant ships sunk off the Azores, but the more serious war events happened rather around Madeira.

A rebellion in 1926 installed a military regime in Portugal, which paved the way to Salazar's *Estado Novo* (also called *salazarismo*). António de Oliveira Salazar, an economist, became a strong and influential finance minister in 1928, and in 1932 was appointed Prime Minister, he ruled until 1968. Portugal was transformed into a corporatist-authoritarian state dominated by Salazar's fascist party *União Nacional*. During the Spanish Civil War (1936–1939), Portugal remained neutral, but indirectly favoured Franco. Though Portugal preserved its neutrality in the Second World War, too, the Azores were involved in the hostilities: Again, they played a decisive role as a link, this time between the American and European allies in their fight against Hitler Germany, esp. in the Battle of the Atlantic.

In August 1943, the Lisbon government allowed Great Britain to use the port of Horta, Faial, the port of Ponta Delgada, São Miguel, and the military installations on São Miguel (*Santana Field*) and Terceira (*Lajes Base*, *Lajes Field*, in the *Plain of Lajes*, in the northeast of the island). Little later, from December 1943 onwards, the *Royal Air Force* on Terceira was joined by the *United States Army Air Force* and the *US Navy*. In a joint effort, they made Lajes Airport a large military facility, which played a key role in World War II, particularly in the Battle of the Atlantic. In November 1944, the Americans were, after difficult negotiations, allowed to build an airfield in Ponta do Monteiro, in the west of the island of Santa Maria, which was closer to the European and North African mainland than Terceira. The British soldiers departed in 1946, while the Americans remained on the base of Santa Maria. American rights to *Lajes Field* were re-negotiated after the war, so that *Lajes Field* remained a strategically important facility for the United States and, later, for the NATO as a whole: In 1949, Portugal joined the NATO, and in 1951 a base treaty permitted the stationing of

NATO troops on the Azores (see Consulate of the United States).

The presence of foreign soldiers who stayed longer than the ship crews of earlier days led to a noteworthy change in the traditional Azorean life style. The contact between the strangers and the local population was intense, and at festivals and parties close relations were established. Typical Anglo-Saxon sports such as hockey and football became established, beer consumption rose, and the first brothels opened.

During the 1957/1958 Capelinhos volcanic eruption and the associated earthquakes on Faial, Salazar was still in power. There is disagreement as to how successful the Salazar government actually was in the management of the disaster. Ramos Villar (2006, 14) points out that, in economic terms, the Portuguese government at that time was unable to help, due to the recession and the outbreak of the colonial war. According to de Oliveira (2008, 101) the “Portuguese government did not feel obligated to provide any type of help...”, while according to the analysis by Coutinho et al. (2010, 265) “response, recovery and rehabilitation were generally highly successful”, with much of the credit, however, going to Dr. António de Freitas Pimentel, the local Civil Governor, who has been praised for his effective leadership, his highly successful management of the emergency situation, and for the active role he played influencing the US legislation to allow immigration from Faial.

The so-called Carnation Revolution of 1974 overthrew Salazar's successor regime and released the colonies into independence. What followed on the Azores was a period of some political instability and of a new orientation towards independence, which, on 8 September 1976, led to the establishment of the first regional self-government, the *Governo Regional dos Açores*, with its own president and its own parliament. Their new policy is clearly orientated towards regional interests. For instance, it promotes local production sectors such as viticulture, and created a special department to promote Azorean tourism, which is still less developed than tourism on Madeira. In 1986, Portugal joined the European Communities. Today,

some areas of Portugal, including the *Região Autónoma dos Açores*, are defined by the European Union as less developed regions and, accordingly, are supported by a number of regional funds (European Commission 2014). Examples of Azorean projects relevant to our context, which have benefited from investment through EU regional policy programs are entitled *The soft energy of the volcanoes* (geothermal energy), *Make the sea our servant, not our master* (wave energy), and the *Capelinhos Lighthouse Environmental Information Centre* (website of the European Commission: ec.europa.eu).

The Carnation Revolution of 1974 and the full autonomy of 1976 put an end to centuries of ‘slow communications’ between Portugal and the Azores isolated within the ocean, characterized by “neglect, absenteeism and under-development of the resources found within the islands” (Ramos Villar 2006, 9). Since it became a member of the European Communities, the Azorean economy has grown, and there have been major increases in living standards in Portugal as a whole (Coutinho et al. 2010, 278). These three key events of the century (revolution, autonomy, EU membership) have also brought changes in the economic and demographic ‘pre-disaster vulnerability’ of the islands, because they are no longer the poor and peripheral region of Portugal they still were during the Capelinhos emergency (Coutinho et al. 2010, 268f.). Quantity and quality of support after natural disasters have improved. When an earthquake on 1 January 1980 (see Fontiela et al., Chapter “[Characterisation of Seismicity of the Azores Archipelago: An Overview of Historical Events and a Detailed Analysis for the Period 2000–2012](#)”), killed more than sixty people and injured about 600, made thousands homeless and destroyed the historical centre of Angra de Heroísmo, this was the first time that “the Lisbon government shouldered its responsibility and obligations” (de Oliveira 2008, 101). The reconstruction was also helped by generous grants from the USA, which still hold their military base in Lajes. Another earthquake struck Faial in 1998, killing eight people, injuring 150, and making ten times as many homeless.

According to Coutinho et al. (2010, 278), it showed that the new system of civil defence infrastructure, which is organized like a cascade, works well. There was considerable financial support and public investment. What still remains vulnerable, however, is the traditional building stock of the Azores.

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### 3 What Azoreans Have Gained from Nature

Throughout Azorean history, the primary sector of the economy (agriculture, fishing, whaling) has played a key role. For hundreds of years, Azoreans have tilled the volcanic soil rich in alkalies from the source rock (see Larrea et al., Chapter “[Petrology of the Azores Islands](#)” and Beier et al., Chapter “[Melting and Mantle Sources in the Azores](#)”), to produce agricultural products for subsistence and for export. Nature has allowed them to grow, mostly without irrigation, a wide variety of plants we know from tropical, subtropical and moderately climatised regions. The kinds of plants grown, more or less successfully, varied over the centuries.

#### *Colours, crops, and cattle*

The first settlers and cultivators in the fifteenth and sixteenth centuries mainly grew sugar cane and wheat (which was needed for the market places in Ceuta, North Africa). Neither of the two crops proved to be successful in the long run. The most important products the Azores exported at that time were plants used as colouring agents (mainly for garments): *Roccella tinctoria* (*orchil*) and *Isatis tinctoria* plants (*woad*, *glastum*). Both lost their importance in the middle of the seventeenth century, when they were replaced by indigo. From the beginnings, the rich fishing grounds were exploited, and the animals that had come to the islands with the arrival of the Europeans provided food for the settlers. Trees were felled and forests cleared rapidly in the course of the fifteenth and sixteenth centuries for a variety of purposes, mainly ship building.

The sixteenth century marked the end of sugar cane and wheat, and the beginning of the cultivation of sweet potatoes (*batatas*), citrus and other fruits, and wine. In the seventeenth century, the most important crops were oranges, batatas, and wine, and people also cultivated corn and flax. The seventeenth and early eighteenth centuries saw a certain economic boom, because improved boat connections increased exports to mainland Portugal. New crops entering the Azores in the nineteenth century were pineapples (an important crop for export, grown in greenhouses), tobacco, and, since 1883, the famous tea grown at Gorreana on the northern coast of São Miguel. Today, the tea factory, plantation and shop are a tourist attraction. The nineteenth century witnessed disasters in Azorean agriculture: Apart from potato rot, vineyards were destroyed by grape blight in the middle of the century, and at the end of the century, the citrus blight caused a breakdown in the cultivation of citrus fruit, esp. oranges.

In the twentieth century, the sugar beet was introduced. A much more fundamental change, however, as a consequence of Salazar's policy of economic autarchy, was the dramatic transformation of the Azorean primary sector from traditional crop production to cattle breeding, now the most important agricultural branch. The Azores were supposed to be Portugal's main supplier of beef and dairy products. Around 1980, there were about 150,000 heads of cattle, in 2001 it was 231,000, plus 62,000 pigs. About 50,000 heads of cattle are exported to Portugal every year. The breeding of cattle amounts to about 70% of Azorean exports. Cattle and dairy farming are not competitive in the EU and need subsidies. They suffer from the general structural weaknesses of the Azorean agriculture, which according to Wakonigg (2008) are: The traditionally strong contrast between a few large and privileged landholders on the one hand and the large number of businesses too small to be really productive on the other, the lack of processing capacity and effective marketing strategies for high-quality products, and the long distance to the Portuguese and other European markets,

which causes high transportation costs and reduces the quality (especially of livestock).

Today, it is estimated that about 52% of the total area of the Azores is used agriculturally, of which almost three quarters are pasture. The remaining area of about 15% of the islands is used for growing crops, esp. corn (to feed cattle), potatoes, sugar beets, oranges, wheat, bananas, and wine. However, Azorean agriculture cannot provide the population with sufficient basic foodstuffs, especially bread grain.

### ***Wines, whales, and whale watching***

Traditionally, Azoreans grew three white wine varieties: *Verdelho* and *Terrantez*, both imported from Madeira, and *Arinto de Bucelas*, originating from the area of Lisbon. The main wine cultivation areas producing dessert wines high in alcohol are on Pico, Terceira and Graciosa. The volcanic grounds offer ideal cultivation conditions, because the black basaltic soils store the warmth of the day. In the nineteenth century, wine became the main export article of the Azores. It was exported from Pico to New York, India, Brazil and the Baltic States, and even the Tsarist Court of St. Petersburg ordered the *Verdelho of Pico*. However, in the last third of the century the wine blight (caused by *Phylloxera*), brought in from America, put an end to this climax. The crossing with American wild wines produced new hybrids (*vinho de cheiro, perfumed wine*) low in alcohol, which, according to wine connoisseurs, do not reach the quality of the old wines. Today, there is virtually no wine export any longer. Pico is famous for its network of rectangular vineyards (*currais*, Fig. 2) surrounded by walls made of basalt rock to protect the vines from wind and salty seawater spray. In 2004, the Pico island vineyard culture was classified as a World Heritage site by the UNESCO. It is no surprise that names of wines are motivated geologically, like *Terras de Lava* and *Basalto*. In the Azores, basalt is not only used for the *currais*. As material for buildings and pavements it is ubiquitous. Black basalt often contrasts with white paint or plaster in buildings,



**Fig. 2** *Currais* on Pico (photo Rudolf Beier)

or with white limestone (on the Azores only found on Santa Maria), such as in the renowned Portuguese pavement (*calçada Portuguesa*, Fig. 3).

As compared to the surrounding Atlantic Ocean, the Azores are a shallow-water region (see Vogt and Jung, Chapter “[The “Azores Geosyndrome” and Plate Tectonics: Research History, Synthesis, and Unsolved Puzzles](#)”), the bathymetric swell providing a biologically active area attractive for whales. Whaling was one of the most important activities in the Azores, from its beginnings in 1765, following the American example. The whalers approached the animals in small rowing boats (*canoas*) and caught up to 200 sperm whales a year. The most important product was the oil for oil-lamps, which was won from the blubber, of which a whale delivered between three to four tons. Whale meat is not tasty, so it was usually processed into animal feed or even fertilizers. The so-called *spermaceti*, a waxy mass in the head of a whale, was used for

making ointments, candles, and lubricants. The digestive system of sperm whales provided the so-called *ambergris*, a fragrant substance in which the animals envelop indigestible objects. It was used for the production of valuable perfumes, scored fantastic prices on the world market and was later replaced by synthetic substances. The exhibits of the *Scrimshaw Museum* at *Peter Café Sport* (Horta) show how whale-bones served as material for artful carving. Once a year, the products of whaling were transported by ship to Lisbon. In the long run, the Azorean whalers’ success was limited, because they were not able to compete with American whalers, who had a larger market and better facilities and tools (Ramos Villar 2006, 8). Whaling ended officially in the mid-80s, with the ban on whaling and with the last factory closing in São Roque do Pico due to unprofitability in 1984. The death of whaling was the birth of whale watching, today one of the branches of sustainable tourism.



**Fig. 3** *Calçada Portuguesa*, Horta, Faial (photo Rudolf Beier)

### ***Construction, cans, and cozido***

#### *The secondary sector*

The secondary sector of the Azorean economy (industry, construction) has been restricted to the building and construction industries, the supply of energy and water, and the processing of goods from the primary sector. It consists mainly of small businesses, which produce sugar, canned fish and vegetables, beer, wine, spirits, mineral water, tea, tobacco, milk, cheese, and meat (Wakonigg 2008, 206).

The production of cheese on the Azores goes back to the Flemish immigration in the fifteenth century. The most common type of cheese is still called *Queijo Flamengo*, *Flemish cheese*; it is produced on São Miguel, Terceira and Faial. However, the ‘real’ local cheese is the *Queijo São Jorge*, which is originally made from a mixture of cows’, goats’ and sheep’s milk,

a combination optimally adapted to the livestock of the Azores. This cheese owes its special aroma to the mint that grows abundantly on the pastures of the island. The big whole cheeses are transported to the mainland by means of specially equipped ships. There is also the spicy *Queijo São João do Pico*, which is processed into smaller whole cheeses.

Generally, the secondary sector of the Azorean economy has suffered from emigration and a shortage of qualified labour. It has always been weaker, either than the primary sector, or, more recently, than the tertiary sector (Wakonigg 2008, 235). Elavai (2008) gives the weights of the sectors in the gross regional product for 1980 and for 2004 (primary sector: a decrease from 30 to 13%, secondary sector: a decrease from 26 to 17%, tertiary sector: a rise from 44 to 77%). Apart from the relative weakness and the relative decrease of the secondary sector, this shows us a decreasing weight of agriculture (due to the

unfavourable distribution of property, esp. land, and the increase in the less work-intensive production of cattle), and a considerable increase of the tertiary sector (services, esp. tourism).

Like the people in other volcanically active regions of the world (for example Iceland, New Zealand), Azoreans make use of geothermal energy, which according to Wakonigg (2008) and the Sociedade Geotérmica dos Açores (Sogeo 2011) provided about 22% of their energy consumption in the first decade of the 21st century. Plans are to increase the proportion of geothermal energy considerably (Sogeo 2011). Geothermal energy also helps, as it were, to prepare one special dish, a traditional stew called the *Cozido das Furnas*. Beef, pork, chicken, sausages (like chorizo and morcella), potatoes, cabbage and a number of vegetables are all given into a pot and cooked in an adequate hole in the ground for about six hours. Bom apetite!

### ***Travel and tourism***

#### *The tertiary sector*

Apart from the dairy and cattle industries and fishing (mainly tuna), the modern economic outlooks of the Azores are mainly based on the expansion of tourism. Admittedly, the Azores have not yet arrived in the catalogues of all-inclusive tourism, a fact mainly due to trip difficulties: The traffic is almost exclusively in the hand of the Portuguese air line *TAP* and the Azores regional company *SATA*; there are few charter companies, and only the islands of Terceira, São Miguel and Faial have a daily connection with Lisbon, the usual place of transfer. A regular shipping line between Portugal and the Azores does not exist, and even cruise ships are touching the Azores comparatively rarely. Today, all this does not necessarily have to be a disadvantage. Rather, it may be a good starting point for the development of tourism in a controlled and sustainable way, protecting the Azores and their nature from the pitfalls of mass-tourism.

## **4 How Azoreans Live with the Forces of Nature**

### **4.1 A Word About Azorean Culture**

Is there an Azorean culture? And if there is, is it influenced by the forces of nature, and if yes, how? These questions are delicate, because they require generalizations and invite overgeneralizations. Quite obviously, there are relations between nature and culture, but they are neither direct nor simple. To answer the initial question, it will be helpful to take a closer look at literature. If there is an Azorean literature, this is a very strong piece of evidence that there is an Azorean culture.

#### ***The core of culture***

##### *Portuguese values*

On the one hand, the majority of Azoreans have Portuguese ancestors, their culture has its roots in mainland Portugal. The language they speak is a variety of Portuguese (see Rogers 1948). For most of their history (see Chapter “[Introduction](#)”), the Azores, politically and economically, have belonged to Portugal. With this in mind, it is not surprising that most of the characterizations of Azoreans and the ‘Azorean character’ we can find in the literature fit quite well into the sociocultural pattern that Hofstede and Hofstede (2005) found out about continental Portugal, in their empirically based comparison of 74 countries. In terms of the value of *power distance* (the acceptance by cultures of the unequal distribution of power), Portugal occupies ranks 37 and 38 (a much higher score than the US, ranking 57 to 59, recently the main destination of Azorean emigrants). Concerning the value of *individualism* (vs. *collectivism*), Portugal’s ranks are 49 to 51 (with the US scoring highest of the 74 countries). With respect to values of *masculinity versus femininity* (ambition versus quality of life), Portugal has the rank of 65 (US: rank 19) in the masculinity index (which, interestingly,