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Chapter 1 : Interhemispheric Climate Linkages - IGBP

Synchroneity of climate change, and comparability of climate signals, both temporal and spatial, were the principal parameters for evaluating interhemispheric linkages. The comparisons showed that, depending on the respective temporal, and spatial scales represented by the records, major phase changes in climate are synchronous in the Northern.

Furthermore, global sea surface temperature SST changes associated with ENSO and non-ENSO periods are reported including the observation that ENSO-related SST variability may be lagged systematically by up to three seasons in different basins , changes in landâ€"hydrological system response to ENSO activity with variable correlations over time depending on the strength of the cycle , the influence on tropical cyclone location, frequency and intensity, and the role of ENSO on vector-borne diseases, e. A pervasive feature of this section is current developments in predicting ENSO activity. The second section is a major resource for Quaternary scientists. Here, seven chapters deal with the long-term variations in ENSO activity. Topics include the continued refinement of the impressive Quinn historical records of ENSO activity in Peru and the value of a network of ice, marine and terrestrial particularly tree-ring chronologies for calibrating and developing relatively long, high-resolution records of ENSO throughout the world. For instance, the tree- ring data sets provide strong evidence for long-term Southern Hemisphere mid- and high-latitude climate change driven by ENSO. What comes out clearly is that although ENSO is an interannual cycle, it also operates on a range of different time-scales, confirming once again that the world we live in is far from predictable, and providing the tangible possibility that ENSO-like mechanisms may have played a more significant role in the Quaternary than we at present fully appreciate. This is an admirable publication and would be ideal for anyone who wishes to develop an excellent grounding in past, present and future ENSO activity. It is now clear that to understand the way the planet will respond to predicted global change we need to appreciate the way the planet did respond to past changes of the same type and scale as those we face today. Only this way can we ground-truth our predictive models and perhaps plan for and mitigate some of the effects of global change. Many geological projects are now attempting to deal with these issues. This volume is a report of the progress of such an initiative. The PEP-1 project seeks to document and compare a variety of data from sites along the full length of the Americas with an aim of obtaining an interhemispheric perspective of past climate change and its affect on human civilizations, although many of the papers deal with times well before human habitation. A glance through the contents list impresses with the breadth of studies presented. The 23 papers contained in the volume are grouped into three parts. The first, present-day climates, sets the scene, with four papers discussing the climate today and its drivers. The bulk of the papers are found in the final partâ€"long-term climate variability. Here longer term geomorphological, lacustrine and vegetative evidence is used to address issues such as the palaeoclimatic significance of late Quaternary aeolian records Muhs and Zarate , glaciation along the American Cordillera during oxygen marine isotope stage 2 Clapperton and Seltzer and Holocene vegetation and climate variability Grimm et al. This section also contains a good overview of PEP-1 by Markgraf, which puts key results into a broader scientific context. The range of topics covered in the entire volume is immense; from a discussion of polar air outbreaks in the Americas, through the use of high-resolution seismic stratigraphy in lakes to the effects of catastrophic volcanic eruptions on human populations in Central America. This latter paper by Sheets is particularly interesting if a little off the topic of climate change sensu stricto. Looking at several successive Central American civilizations Sheets documents how each fared following a catastrophic eruption. The data suggest that simple societies are affected less, and recover faster, from the eruptions than complex onesâ€"a lesson for us all. Most papers are well written and presented, the diagrams are clear although in some cases the captions could contain more explanatory detail. Each paper referred to in the volume as a chapter is self-contained with an abstract in English and Spanish together with a bibliography. This structure leads to a deal of repetition, for example every paper explains what PEP-1 stands for. To a reader starting at one end of the book and working through this can be a mild annoyance but I suspect that this volume, simply because of the broadness of the topics covered, will by dipped into by people interested one particular facet of the project or another. This is an important volume, the result of providing a community of scientists with a well-organised intellectual framework within which they can plan their research and report their results. This volume, however, should be considered a report on progress so far. In his forward Herman Zimmerman writes: However, I would regard the description of the project as mature as jumping the gun. The reason for this lies in the data itselfâ€”there is a clear bias in the source. As might be expected most comes from North America leading to an imbalance in the data which often leads to the situation where authors are trying to compare detailed, high-resolution data sets from a large number of sites in North America with sparser more limited data sets from South America. There are probably a number of reasons for this; more workers and a longer history of study in the North Americas clearly being two of the key factors. The result of this comparing apples and oranges is that reading through the volume I seemed to miss any clear statements of interhemispheric linkages. A project based squarely on comparisons of widely dispersed data sets can be considered fully mature only when the data from both hemispheres are of a similar standard and the various authors can come to grips with comparing apples with apples. Nonetheless this is a significant worthwhile volume, containing a great deal of data that deserves to be on the shelves of libraries and any researchers interested in climate change past and future. There are also five further contributions pertaining to southern Africa two , northern Africa two and the Arabian Peninsula one. These additional contributions are somewhat peripheral to the main theme of the volume, but nevertheless provide new and interesting palaeoenvironmental data from regions where there is still relatively little published research. The papers presented here reflect a variety of different approaches to reconstructing past environments. Contributions based on geomorphological evidence include the analysis of Holocene soil creep in Rwanda Moeyersons and the age and significance of Quaternary colluvium in eastern Zambia Thomas and Murray. Multiproxy studies of sediment cores are presented from Uganda Taylor and Robertshaw and Kenya Barker et al. In the first contribution, Junge provides a synthesis of palaeoclimatic data covering the past 40 yr in Central Africa. A fold-out map summarising the sequence of environmental change across the region is included along with diagrams of precipitation and temperature records from meteorological stations in Central Africa. The information contained in these fold-out sheets would be valuable to anyone undertaking palaeoenvironmental research in this region. Here, they argue that interpretation of the significance of palaeo-Lake Congo remains problematic owing to a lack of data on the nature and timing of the relatively recent geological changes that resulted in the present-day configuration of the Congo Basin. Runge presents a review of studies of sediments and soils in the Kivu region of former Zaire. He argues that drier conditions than previously thought prevailed in the wider Central African basin during the Late Quaternary, presenting evidence for forest retreat in the eastern Kivu region between 36 ka and 13 ka. Also discussed is geomorphological evidence for three phases of contrasting dry and wet seasons, from 36 to 28 ka, 21 to 18 ka and 13 to 12 ka, which led to increased geomorphological activity. Moeyersons focuses on the palaeoenvironmental significance of soil creep in southern Rwanda during the Late Pleistocene and Holocene. Geomorphological data from the Butare Plateau indicate wetter conditions between 15 to 5 ka, after which slopes become more stable. There are, however, three phases of soil erosion during the late Holocene, the youngest of which Recommended.

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Chapter 2 : Vera Markgraf | People | INSTAAR | CU-Boulder

This book presents a novel approach in the field of global change by presenting a comprehensive analysis of interhemispheric linkages of climate, present and past, and their effects on human societies.

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Chapter 3 : Interhemispheric Climate Linkages - Google Books

Interhemispheric Climate Linkages presents a comparative analysis of across-hemisphere linkages of climate and their effects on human societies, thus providing a framework for the study of global change.

As part of the Hadley model of atmospheric circulation, the equator is characterised by the ascending branches of separate meridional cells, driven by intense insolation. As these inwards flows of air converge they reduce horizontal wind speed, and as they rise, they form precipitation. The vertical convection also results in a net export of heat and freshwater from the lower atmosphere into the troposphere [23] [25] This system is known as the ITCZ. The location of the ITCZ is centred on the areas of highest insolation, although it is more stationary over the oceans than landmasses. Some studies advance ideas that describe one or more atmospheric cells over the equator, [26] while others state that the position of the ITCZ depends on Ekman pumping efficiency and moisture availability. These include continental convection and equatorially asymmetric sea surface temperature SST distribution. As an integrated component in the global climate system, the SAMS is influenced the Atlantic sector of the ITCZ, variability in the adjacent Pacific and Atlantic Oceans, the Andean and central-east Brazil topography, complex land surface processes and relations with land use change, and interactions involving topography and soil moisture. The Pacific and Atlantic subtropical high: These are semi-permanent high pressure systems caused by descending sectors of the equatorial Hadley cells. The air masses are relatively warm and dry, and move in an anticyclonic circulation pattern over the sub-tropical oceans. The Pacific High is generally stable, whereas the Atlantic High moves throughout the year. During the summer, it covers most of the midlatitude and subtropical Atlantic Ocean. During winter, it is smaller and moves to the east. The Gran Chaco thermal low: A semi-permanent thermal- orographic depression located over the slope extending from Chaco to the Los Andes mountain range in the Argentine Northwest. It can be considered, together with the Bolivian High, as the regional response of the tropospheric circulation to the strong convective heating over the Amazonâ€”central Brazil. The Andes effect reinforces the strength of the Chaco Low as an orographic barrier. The resulting pressure gradient between the south Atlantic subtropical high and the Chaco low forces the easterly winds over the Amazon basin to turn southward, being channelled between the eastern slope of the Andes and the Brazilian Plateau. The SACZ controls rainfall in the southern subtropics and extends southeastward from the large continental convective zone of tropical South America. It is generated by moisture convergence between the South Atlantic high pressure zone and the continental thermal low pressure zone. The intensity of the SACZ is highest in austral summer, in phase with intensifying continental heating and convection. An intensified SACZ is associated with enhanced streamflows to the north and diminished flows to the south. Polar outbreaks occur when cold dense polar air masses pass beneath warmer tropical air masses, significantly cooling subtropical South America. They occur as a result of anticyclogenesis in the Pacific subtropical high, which is constrained at a low level by the southern extent of the Andes mountain range. This leads to the formation of a slow-moving long wave that creates mountain-parallel, ageostrophic flow, causing incursions of high-latitude cold air. They generate an important drop in temperature and increase in pressure, resulting in regional precipitation for southern South America. These surges occur mainly during the winter but their impact on the precipitation is even greater during summer. LLJs originate in a low pressure area over the northern Andes and provide moisture for subtropical latitudes. They are controlled by Amazonian wind patterns, which are influenced and controlled by patterns of insolation. They transport large amounts of moisture from the Amazon basin to the monsoonal anitcyclone over Bolivia. These phases are linked to short-term extreme precipitation events in the plains of central Argentina. When the LLJ is weak, there is enhanced SACZ and suppressed convection to the south and extreme heat waves over the sub-tropical regions. South America experiences westerly winds in the middle latitudes, caused by the Coriolis force and associated geostrophic circulation patterns. They are more intense than their Northern Hemisphere counterparts due to the lack of continental landmass in the Southern Hemisphere. They reach their maximum speed in the troposphere, where they form jetstreams. In the Andes, winter rains reach further north. During summer, the Pacific anticyclone shifts southward, impeding the northward migration of the westerlies. It has been explained as the response of diabatic local heating in the Amazon region. The MJO is characterized by an eastward progression of large regions of both enhanced and suppressed tropical rainfall, observed mainly over the Indian Ocean and Pacific Ocean. It is a source of intra-seasonal variability affecting South America that seems to be related to a combination of tropical circulation changes and midlatitude Rossby wave trains that propagate into South America. The development of the SAMS during spring is characterised by a rapid southward shift of the convective region from northwestern South America to the highland region of the central Andes and to the southern Amazon basin. The South Atlantic High moves eastward, reflecting the pressure reduction over the continent and the intensity and direction of the zonal flow over the nearby tropics and sub-tropics. This change in flow direction is evident in changes to terrestrial windfields over extreme southwestern Amazonia, with winds changing from northerlies to northwesterlies, and over eastern Brazil, where the winds turn from easterlies to northeasterlies. As the SAMS progresses a continental-scale gyre transports moisture westward from the tropical Atlantic Ocean to the Amazon basin and then southward toward the extratropics of South America. The decay phase of the monsoon begins between March and May, as convection shifts gradually northward toward the equator. During April and May, the low-level southward flow of moisture from the western Amazonia weakens, as more frequent incursions of drier and cooler air from the mid-latitudes begin to occur over the interior of subtropical South America.

Chapter 4 : Geography of South America - Wikipedia

Interhemispheric Climate Linkages.. [Vera Markgraf; Markgraf, Vera.] -- This book presents a novel approach in the field of global change by presenting a comprehensive analysis of interhemispheric linkages of climate, present and past, and their effects on human.

Chapter 5 : Antarctic Cold Reversal - Wikipedia

Abstract. This book presents a novel approach in the field of global change by presenting a comprehensive analysis of interhemispheric linkages of climate, present and past, and their effects on human societies.

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Chapter 8 : - Interhemispheric Climate Linkages by Vera Markgraf

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