南极普里兹造山带性质及构造变形过程

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中文摘要:南极大陆足世界上最古老的大陆之一,是冈瓦纳大陆的重要组成.第一次南极科学考察以来,中国地质科学院一直参加南极研究.目前为止,已有33人次参加了14次南极考察,其中2人进入南极内陆格罗夫山考察.经过几代科学家20多年的努力,取得了一系列成果.传统观点认为,东南极大陆是由太古宙陆核与围绕陆核的元古宙活动带组成,东冈瓦纳大陆在晚元古代格林威尔事件后完成统一大陆的构建.上世纪90年代初,在原属于环东南极格林维尔活动带的不同部位识别出-系列晚新元古-早古生代的泛非期(约500 Ma)构造热事件,对传统的东南极大陆模式提出了挑战.其中,普里兹湾地区泛非构造热事件在最近几年的研究中被中国科学家证明向南延伸到南极内陆的格罗夫山一带,在东南极大陆内部形成了一条泛非期构造带.然而,普里兹带的构造属性一直受到研究者的争论.人们关注的焦点是这条泛非期普里兹构造带到底是一条陆内变形带?还是板块碰撞带?因为这个问题直接关系到东南极大陆的结构与形成时代,更关系到东冈瓦纳大陆形成演化过程的重建.2007年,"南极普里兹带1:50万地质图编制"与"南极埃默里冰架-格罗夫山综合地质调查与研究"课题组对普里兹带研究取得了重要进展:①完成了我国在南极的第一张中比例尺地质图,为普里兹构造带的研究、为探讨冈瓦纳大陆的重建,奠定了新的基础;②格罗夫山地区首次发现高压麻粒岩,根据石榴子石的化学环带和单斜辉石原始成分的恢复获得峰期变质条件为12.9～15.8 kb、810～910℃,减压退变质条件为7.6～10.3 kb、700～760℃,具有顺时针演化的P-T轨迹.SHRIMP锆石U-Pb定年揭示高压变质作用发生的时代为545～542 Ma.这项成果首次为确认普里兹构造带为碰撞造山带提供了直接的岩石学证据;③普哩兹构造带麻粒岩地体变质作用、花岗岩浆侵位构成的热事件经历了ITD IBC发展轨迹,也是大陆碰撞带的指示标志;④基本上确定了普里兹构造带构造格架与变形序列及演化过程;⑤发现格罗夫山地区大型低角度韧性剪切变形带,变形时代为.530～480 Ma;⑥格罗夫山地区NENNE向延伸的沟谷-纵岭地貌特征是由于晚中生代到新生代区域上蓝伯特裂谷发育过程中形成的.

中文关键词:东南极大陆 普里兹构造带 泛非期构造热事件 格罗夫山

Advances in the Study of the Orogeny and Structural Deformation of Prydz Tectonic Belt in East Antarctica

Abstract:Antarctica is one of the oldest continents in Earth and is an important part of the Gondwana super-continent.Since the first Chinese Research Expedition team set foot on the Antarctica,geologists from the Chinese Academy of Geological Sciences(CAGS) have kept working on this continent.Up till now,there have been 33 CAGS geologists landed to Antarctica,and two of them have studied the Grove mountain area and made tremendous achievements.Traditionally,east Antarctica has been regarded as an Archean core complex surrounded with the Proterozoic mobile belts,which were formed during the Late Proterozoic Grenville events.At the beginning of the 1990's,some geologists discovered the late Neoproterozoic?early Paleozoic Pan-Africa events(about 500 Ma) in different areas of the Grenville belt within east Antarctica.Of these Pan-Africa events,the one discovered in Prydz Bay has been proved by some Chinese geologists to extend to the Grove mountain area of inner Antarctica.Therefore,whether there exists a Pan-Africa tectonic belt dividing the east Antarctic continent into two parts in east Antarctica is a challenge to the traditional east Antarctica continental model.There have long existed serious controversies concerning the nature of the Prydz belt.Recently,the discussion has been focused on whether the Prydz belt is an intra-continent deformation belt or a continent collision belt.The character of the Prydz belt is the key to understand the reformation of east Antarctica and the Gondwana continent.The research conducted by the authors has confirmed the continental collision character of the Prydz belt.In the course of implementing the projects of "1:500000 Geological Mapping of the Prydz Belt in Antarctica" and "Comprehensive Investigation and Research of Emery Ice Shelf-Grove Mountains,Antarctica" in 2007,remarkably progresses were achieved in the study of the Prydz belt.The new progresses are as follows: ①The first middle scale mapping(1:500000)in Prydz,Antarctica,was completed.The map serves as a foundational base for the research on the Prydz belt and the reformation of the Gondwana continent.②High pressure metamorphic granulite rocks were first found in the Grove area.Based on the striped components of garnets and the composition of clinopyroxene,the peak metamorphic condition should be P=12.9～15.8 kb and T=810～910° C,whereas the degrading metamorphic condition is P=7.6～10.3 kb and T=700～760° C.The metamorphism has the feature of a clockwise P-T path.The SHRIMP zircon age for the high pressure granulites is 545～542 Ma.These data serve as the important continental collision evidence for the Prydz belt.③The ITD+IBC path determined by the Pan-Africa metamorphism and granitoids in the Prydz belt is another petrological indicator of continental collision.④The tectonic framework,deformation sequences,and tectonic evolutional process were constructed based on the research on structural analysis.⑤There is a large low angle ductile zone in the Grove Mountains,whose age is around 530 to 480 Ma.⑥The NE-NEE trending valley-ridge topography of the

Grove Mountains is a product of the Lambert rift during late Mesozoic and Cenozoic.

keywords:east Antarctica Prydz tectonic belt Pan-Africa tectonic event Grove mountains