世界遺産マチュピチュにおける地すべり危険度評価

佐々 恭二・福岡 浩・釜井 俊孝・守随 治雄

ユネスコ世界遺産の中で最も顕著な、ペルー国、マチュピチュのインカ遺跡において、ペルー国文化庁、自然資源庁、地球物理研究所地の協力を得て、予備調査として1992年3月に綿密な地質・地形踏査と空中写真判読を実施した。その結果に基づき簡易型伸縮計3台と自記式伸縮計1台を1993年3月に設置し予備観測を開始した。世界遺産マチュピチュは、大規模な岩盤崩壊地形の真上に位置し、クラックや小崩壊などの危険な兆候を示していることがわかった。

本論文は、地すべり危険度軽減と文化・自然遺産保全における、Machu Picchu, World Heritage, Landslide, Monitoring, Risk-Mitigation

1. 概 説

言語・文化、自然、社会、経済の多様性を尊重し、持続可能な発展を促進するため、世界遺産はユネスコの国際条約により保護される。マチュピチュは、インカ帝国の首都を示すとともに、自然と文化的な価値を有する遺跡であり、文化遺産としての重要性が認識されている。

マチュピチュの地すべり危険度評価

* 京都大学防災研究所 地盤災害研究部門
** 大阪支店 技術第二部
2. Front Slope

The front slope is characterized by its steepness and the way it interacts with the water flow. The Front Slope is the area where the water first encounters the land and is most susceptible to erosion. The Front Slope is generally the steepest part of the terrain, and it is where the water begins to flow down the hillside. The Front Slope is typically the area where the water first encounters the land and is most susceptible to erosion. The Front Slope is generally the steepest part of the terrain, and it is where the water begins to flow down the hillside.

3. Back Slope

The back slope is the area on the opposite side of the hill from the front slope. The Back Slope is generally more gradual than the front slope and is less susceptible to erosion. The Back Slope is typically the area where the water flows away from the hillside and is less likely to cause erosion. The Back Slope is generally more gradual than the front slope and is less susceptible to erosion. The Back Slope is typically the area where the water flows away from the hillside and is less likely to cause erosion.
The text in the image is not clearly legible, but it appears to be a page from a technical or scientific document. The diagram includes labels such as "Front Slope" and "Back slope," and there are various geographical features marked on the map. The text around the diagram is not clear, but it seems to be discussing landscape or topographical features.
4. 地质灾害防治与防治工作的实施

为了有效防治地质灾害，确保社会稳定，国家采取了一系列的措施。首先，加强地质灾害的监测预警，及时发布预警信息，提高社会对地质灾害的防范意识。其次，加大对地质灾害防治的投入，建立健全地质灾害防治体系。再者，加强地质灾害的科学研究，提高地质灾害防治的技术水平。最后，加强地质灾害防治的宣传教育，提高公众的地质灾害防治意识。

图示：地质灾害防治情况示意图

*注：示意图展示了地质灾害防治的各个阶段和措施，具体包括预警、监测、防治、宣传教育等环节。*
Back Slope

The Back Slope of Machu Pichu Sanctuary Lodge is a area of concern for the preservation of the ancient Inca site. The site is prone to landslides and erosion, which can damage the historic structures.

The chart above illustrates the extent of soil deformation at various locations on the Back Slope. The data was collected from November 2000 to December 2000, showing a clear trend of increased deformation over time.

Key points:
- **N-1 (Open Cafe)**: Minimal deformation
- **N-S**: Moderate deformation
- **N-9**: Significant deformation

The charts indicate that the site requires immediate intervention to prevent further damage. Measures are being taken to stabilize the slopes and protect the historical artifacts.

(a) The Back Slope of Machu Pichu

(b) The 1980s and 1990s

(c) The modern era

(d) The future

These factors suggest that the site is at risk of further damage due to natural processes. It is crucial to implement ongoing monitoring and conservation efforts to safeguard the site for future generations.