The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation
Forest Department

The Dynamic Earth: with special reference
 to active tectonic events in Myanmar

Dr. Ye Myint Swe, Director General
Department of Geological Survey and Mineral Exploration
Ministry of Natural Resources and Environmental Conservation

December, 2016
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>i</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Geology and Tectonic Setting of Myanmar</td>
<td>1</td>
</tr>
<tr>
<td>Active Seismotectonics</td>
<td>3</td>
</tr>
<tr>
<td>Discussion</td>
<td>4</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>5</td>
</tr>
<tr>
<td>References</td>
<td>5</td>
</tr>
</tbody>
</table>
The Dynamic Earth: with special reference to active tectonic events in Myanmar

Ye Myint Swe

Department of Geological Survey and Mineral Exploration
Ministry of Natural Resources and Environmental Conservation

Abstract

Myanmar is situated within the complex tectonic zone of the presently active oblique convergence between Indian and Asian plates. The area also represents a transitional zone between the main Himalayan collision in the north and active subduction system in the Java trench to the south. The main tectonic provinces of Myanmar are elongated N-S and extending from the east Himalayan syntaxis to Andaman Sea in the south.

The Sagaing fault, an active deep-seated arc parallel transcurrent fault formed by the opening of the Andaman sea, which traverses through central Myanmar in a N-S direction close to the western edge of the Shan-Thai block and forms the boundary between the Asian and Indian plates. The Naga-Chin-Rakhine ranges and Andaman-Nicobar ridges in the south were formed as a result of subduction of the Indian plate under the Asian plate. The turbidite prisms and ophiolitic rocks are progressively thrusted westward upon the Indian plate during subduction. The active tectonic deformation between the western edge of the Shan-Thai block in the east to Andaman trench to the west are directly related to northward motion of the Indian plate.

Shallow and intermediate depth earthquakes have occurred along the Naga-Chin-Rakhine Ranges and large historic earthquakes with tsunami were also reported around the Nicobar and Andaman islands. The dextral Sagaing fault is seismically still active and many large earthquakes have also produced mainly by strike slip surface break.

Keywords: active subduction, Asian plate, dextral Sagaing fault, earthquakes, Himalayan collision, Indian plate,
INTRODUCTION

The Myanmar is located in a key position of the convergence between Indian and Asian plates and exhibits the great diversity of geology, physiography, structural deformation and associated shallow and intermediate depth earthquakes. The Indian plate has been moving northeastward against the Asian plate giving rise to much of structural deformation of earth surface and the several earthquakes in Myanmar and surrounding regions.

The purpose of this paper is to review the Neogene tectonic deformation and seismicity of Myanmar in relation with oblique convergence of two major plates largely based on the previous studies of (Curray et al., 1979; Win Swe, 1981; Le Dain et al., 1984; Hla Maung, 1987; Guzman and Ni, 1996; GIAC, 1997; Bertrand et al., 1998; Vigny et al., 2003; Win Naing, 2006; Maung Thein & Tint Lwin Swe, 2006; and Soe Thura Tun, 2007).

Geology and Tectonic Setting of Myanmar


The central basin contains dominantly Tertiary marine and fluvialite sediments separated into fore arc and back arc basins by the inner magmatic arc of the Bengal subduction system. The Naga-Chin-Rakhine ranges, the Indo-Burman ranges of (Bender, 1983), and Andaman-Nicobar ridges in the south were formed as a result of the eastward subduction of the India plate. The turbidite prisms and ophiolitic rocks are progressively thrusted westward upon the Indian plate during subduction. The existence of mud volcanoes in the oil bearing Miocene mudstones on Cheduba and Ramree islands also suggests high pore pressure due to overthrusting and compressional tectonic stress (Le Dain et al., 1984). The Andaman-Nicobar ridges also represent as the accretionary prism of the subduction zone characterized by imbricate stack of eastward dipping fault slices and folded structures in the Cretaceous ophiolites and older deep sea sedimentary rocks (Curray, 2005).
Fig(1) Generalized tectonic setting of Myanmar   (after GIAC Project, 1997)
The effect of oblique convergence and the Andaman sea opening have been caused strike-slip plate motion in Myanmar (eg. ~20mm/year along the dextral Sagaing fault). The Sagaing fault, an active deep-seated arc parallel transcurrent fault, which traverses through central Myanmar in a N-S direction close to the western edge of the Shan-Thai block and forms the boundary between the Asian and Indian plates (Curray et al., 1979; Win Swe, 1981; Le Dain et al., 1984; Hla Maung, 1987; Guzman and Ni, 1996; Bertrand et al., 1998). The fault branch in various splays north of the Mandalay and appears several relay zones characterized by pull-apart lakes (eg. Yega Lake near Sagaing, Indaw Lake near Indaw and Lake-Indawgyi in the Kachin State) and terminated in the jade mine belt into a compressive horse tail structure. The southern termination of the fault is also represented as horse tail extensional system connecting to the Andaman spreading centre (Rangin, 2002).

The western province between the Sagaing fault and active subduction zone west of the Myanmar is known as the Myanmar plate (Curray et al, 1979; Mitchell et al., 2006).

**Active Seismotectonics**

Many large earthquakes seem to have occurred along the major active faults. In Myanmar, most of the seismic activity defines a platelet bordered westward by the Andaman subduction trench and eastward by the edge of the Shan plateau (Vigny, 2003). The two main causes of earthquakes in Myanmar are (1) the continuous subduction, collision in the north, between Indian plate and Asian plates beneath Myanmar platelet, and 2) the northward motion of Myanmar platelet from the spreading centre of the Andaman sea (Maung Thein & Tint Lwin Swe, 2005).

The active oblique convergence between Indian and Asia plates caused the very large overthrusts in an association with shallow and intermediate depth earthquakes along the Naga-Chin-Rakhine Ranges. The large historic earthquakes with tsunami were also reported around the Andaman-Nicobar Islands. Most of the larger destructive earthquakes are also associated with strike-slip motion of plate boundary along the Sagaing fault through the Andaman sea in the south to the Bago-Taungoo-Sagaing-Thabeikkyin-Tagaung trend in the north.
Discussion

The tectonic history, active faulting and seismicity in Myanmar cannot be separated from oblique collision of Indian-Asian plates. The geological provinces and the major faults in Myanmar, trending N-S to NE-SW direction, also indicate that Myanmar is squeezed between the Indian and Asian plates as a result of northward motion of the Indian plate. The major seismic activities are also confined along the active slip of the Sagaing fault, and along the subduction zone around the Andaman-Nicobar islands in the south toward Naga-Chin-Rakhine Ranges to the north. The earthquakes occurred in the offshore area especially around the Andaman-Nicoba subduction arc may generate tsunami around the Myanmar offshore region.

Acknowledgments

I would like to thank Union Minister U Ohn Win, Ministry of Natural Resources and Environmental Conservation, the Republic of the Union of Myanmar for his encouragement and suggestion for this research paper.
REFERENCES


Maung Thein & Tint Lwin Swe, 2006, The seismic zone map of Myanmar (Revised version, 2005), Myanmar earthquake committee.


