

## Results of the Dendrochronological Studies in Mongolia

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### Abstract

The Mongolian-American Tree-Ring Project was initiated in 1995 to develop longer climatic records in Mongolia and to help establish capabilities in Mongolia for independent tree-ring analyses. The records from old-aged trees can provide more complete information about the variations in the climate system and aid in planning for future changes or variations in climate. Many areas of Mongolia have been investigated and tree-ring samples collected. Dendroclimatic records of temperature extending back more than one thousand years and precipitation records of over 300 years have been developed. These records show that global warming is present in Mongolia and that variations in precipitation and stream-flow appear to show some solar influence. Scientists and students trained by the project are now engaged in tree-ring studies in various areas of Mongolia. The project is expected to continue for the next several years.

**Key words:** Dendrochronology, dendroclimatology, temperature, precipitation, Mongolia

### Introduction

The project engages in dendroclimatic research, instruction in research methods, and development of tree-ring research facilities in Mongolia. Dendroclimatic research uses the annual growth parameters from climate-sensitive, old-aged trees to reconstruct and extend the records of climate variations. These longer records are extremely valuable because recorded meteorological data is too short in time to represent fully the variations, extremes, and trends in climate variation. The Mongolian-American Tree-Ring Project (MATRIP) originated in the spring of 1995 through discussions between scientists at the Tree-Ring Laboratory (TRL) of Lamont-Doherty Earth Observatory of Columbia University in the City of New York, USA, and members of the Mongolian Academy of Sciences (MAS) who were visiting New York. Invitations were issued to Drs. Rosanne D'Arrigo and Gordon Jacoby to come to Mongolia for further discussions and initial sampling in the summer of 1995. After discussions with the MAS staff to define the purposes of the project and establish communications with the appropriate government and academic agencies and individuals; logistical arrangements were made to start the first sampling expedition.

The Hydro-meteorological Research Institute and Institute of Botany of MAS supported these

first efforts. Cooperative Agreements were signed between the last two institutes and the Lamont Tree-Ring Laboratory. Trees were sampled at five locations in central and western Mongolia. Old-aged trees of Siberian larch (*Larix sibirica*) and Siberian pine (*Pinus sibirica*) were sampled. The late Professor S. Davaajamts accompanied one sampling trip to the region around Monastery Manzshiriin Hiid, where spruce trees (*Picea obovata*) were also sampled. All the sampling was done nondestructively, using Swedish increment corers. At one site at elevational tree-line in the Mt. Tarvagatai, part of the Khangai Mountains (Figure 1, #2,24) the ring-width pattern observed in the field obviously showed evidence of unusual warming in increasingly wider rings during the 20<sup>th</sup> century and other low frequency ring-width patterns seen in temperature stressed trees sampled around the world (Jacoby & D'Arrigo, 1989). This finding (quantified and analyzed) presented in Jacoby *et al.* (1996) demonstrated the potential value of dendroclimatic research in Mongolia.

### Development of the MATRIP Project

A proposal was written to the National Science Foundation of the USA for research support to continue studies in Mongolia and to help develop tree-ring research facilities in Mongolian institutions. This proposal was drafted with