



STReESS: Studying Tree Responses to extreme Events: a Synthesis

Short Term Scientific Mission

Comparing qualitative and quantitative methods to define intra-ring density fluctuations in conifers

COST Action: FP1106

STSM Reference code: COST-STSM-FP1106-15869

Beneficiary: Filipe Campelo, Centre for Functional Ecology, University of Coimbra, Portugal

Host: Dr. Philippe Rozenberg, INRA Research Center of Orléans, France

Period: 19 – 31 May, 2014

Introduction

Recent works have suggested the use of intra-ring features or anomalies in the intra-annual radial growth as an additional source of ecological and climatological information to the classical tree-ring variables. An example of these anatomical intra-ring features are intra-annual density fluctuations (IADFs) in conifers. In the literature IADFs have been named as “false rings”, “double rings”, “multiple rings”, “multiple growth layers” or “intra-annual growth bands”. A given ring has an IADF when the intra-ring wood density profile differs from the typical earlywood-latewood pattern, with the formation of latewood-like cells within earlywood or earlywood-like cells in latewood. Most of the works dealing with IADFs in the Mediterranean have used the visual method to identify these anatomical structures. This method is very time-consuming and depends on the capacity of the observer to follow the pre-determined criteria to identify IADFs (e.g. the position of IADFs within the ring).

Aim of the STSM

The aim of the STSM was to propose an alternative method to identify automatically IADFs using density profiles.

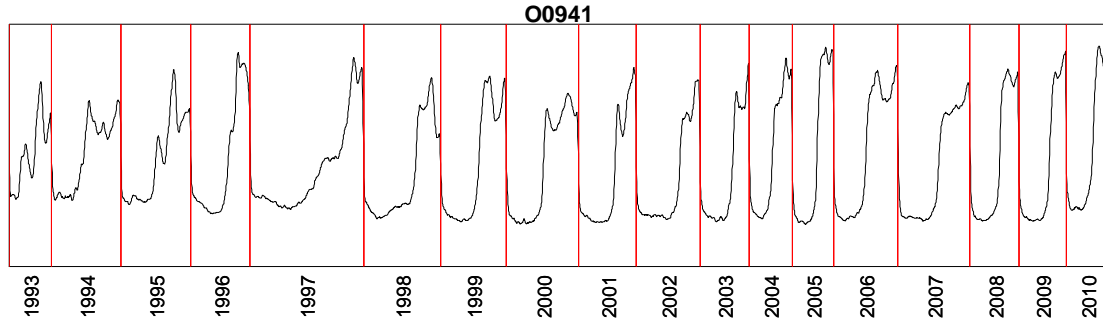
Description of the work carried out during the STSM

In conifers IADFs can be divided in three types: type E, which is characterized by latewood-like cells within earlywood; IADF type L which is considered when earlywood-like cells are within the latewood, whereas the IADF type L+ is characterized by earlywood like cells between latewood and earlywood of the next tree ring. We have developed a new program (identifieR) to convert density profiles (input) into frequency of IADFs (E, L and L+). This program has several parameters that should be precisely defined to give the desirable results. When the parameters are correctly tuned the program can convert automatically density profiles into frequency of IADFs using a quantitative approach.

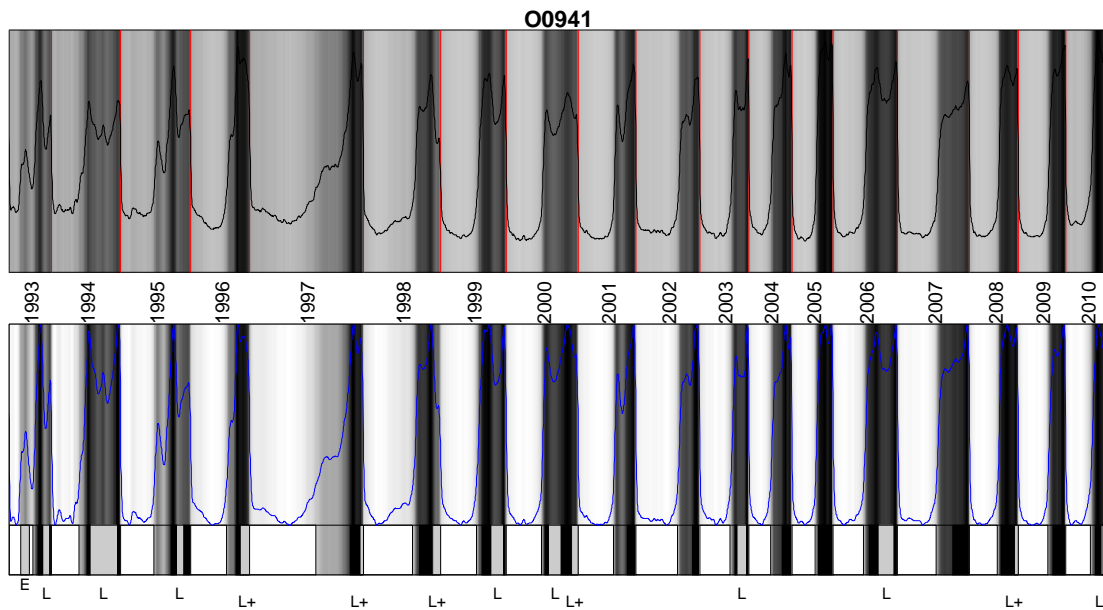
Visual description of the identifierR program

The identifierR program identified correctly the three types of IADFs using only density profiles as input. This program uses a quantitative approach to identify automatically the three types of IADFs without human help and produce two outputs (visual and presence/absence of IADFs). Finally, the IADFs automatically identified were visually checked and the identification was considered to be correct.

Input



Output



| Year | IADF E | IADF L | IADF L+ |
|------|--------|--------|---------|
| 1993 | 1 | 1 | 0 |
| 1994 | 0 | 1 | 0 |
| 1995 | 0 | 1 | 0 |
| 1996 | 0 | 0 | 1 |
| 1997 | 0 | 0 | 1 |
| 1998 | 0 | 0 | 1 |
| 1999 | 0 | 1 | 0 |
| 2000 | 0 | 1 | 1 |
| 2001 | 0 | 0 | 0 |
| 2002 | 0 | 0 | 0 |
| 2003 | 0 | 1 | 0 |
| 2004 | 0 | 0 | 0 |
| 2005 | 0 | 0 | 0 |
| 2006 | 0 | 1 | 0 |
| 2007 | 0 | 0 | 0 |
| 2008 | 0 | 0 | 1 |
| 2009 | 0 | 0 | 0 |
| 2010 | 0 | 0 | 1 |

Description about how the results contribute to the Action aims

During this STSM we develop a new program using R language to transform wood density profiles into IADFs frequency, making possible the use of all X-ray density databases that are available for the TG5.

Confirmation by the host institution of the successful execution of the STSM

The letter of confirmation by the host institution of the successful execution of the STSM is attached in a separate file.

Acknowledgements

I would like to thank the STReESS Cost Action (FP 1106) for funding this STSM. I would also like to thank Philippe Rozenberg, Alejandro Martinez-Meier, Guillermina Dalla-Salda, Rosa Ana Lopez and Margarita Escobar Sandoval for their welcome and help during my visit.

This report may be posted on the Action website.