FLORIDA A&M UNIVERSITY

FLORIDA AGRICULTURAL AND MECHANICAL UNIVERSITY

CITY OF ORLANDO

FLORIDA A&M UNIVERSITY

ENERGY WATER FOOD NEXUS®

INTERNATIONAL SUMMIT FALL 2017

AGENDA

Wednesday – October 18, 2017	ARRIVAL & SET-UP DAY
1 - 6 PM	**Scholars-In-Residence Program: Training Future Leaders and Problem Solvers**
• Installations of Poster Presentations • Sign-In for Scholars-In-Residence with FAMU representative Diane Hall	

Thursday – October 19, 2017	
7:30 AM	On-site Registrations
8:30 AM	**Welcome Remarks Speakers** • Summit Overview: Summit Chair: **Victor Ibeanusi**, Ph.D. Dean Florida Agricultural & Mechanical University School of the Environment • **Larry Robinson**, Ph.D. President, Florida Agricultural & Mechanical University
9:00 AM	**Keynote Address 1: *The Future is Here!!*** **The FAMU –BIOPOLUS INTEGRATED METABOLIC HUB** **István Kenyeres/Erzsébet Poór-Pócsi** , *BIOPOLUS Technologies, Inc.*, Hungary **Victor Ibeanusi,** Dean, *Florida A&M School of Environment,* Tallahassee, FL **Keynote Address 2** **The Education and Research Imperatives for Higher Education in An Era of Accelerating Global Change** **Stephen Mulkey**, Program Officer, NRT/IGE, EHR Division of Graduate Education, *National Science Foundation*, Arlington, VA
10 - 3 PM	Poster Presentation and Technology Expo
10:00 AM	**Plenary Session 1: *Advancing EWFN Networks***
Plenary Session	*Challenges and solutions for advancing EWFN globally* **MODERATOR**: **Dimitri Corpakis,** Former Head of Unit, Research and Innovation European Commission, Brussel Area, Belgium **Speakers:** • **Peder Maarbjerg**, Assistant Director, *US Department of Energy, ARPA-E,* Washington, DC • **Csaba Deak**, Chancellor *University of Miskolc*, Hungary • **Stephen Mulkey**, Program Officer, NRT/IGE, EHR Division of Graduate Education, *National Science Foundation*, Arlington, VA *National Science Foundation*, Arlington, VA • **Istvan Kenyeres/Ersebet Poor-Pocsi**, CEO & President, *BIOPOLUS Technologies, Inc.*, Hungary • **Tracy Young**, Program Director, Core Research and Development, Consumer and Infrastructure solutions*, The Dow Chemical Company*.
12:00 PM	**Lunch** *(On your own or box lunch)*

Track Chairs	**Sharmini Pitter** FAMU, School of Environment	**Karen Consalo** University of Central Florida	**Johnny Grace** FAMU and United States Department of Agriculture	**Saleh Rahman** University of Central Florida
Tracks	**SCIENCE ENTERPRISE**	**ACCELERATED INNOVATION**	**SCIENCE BASED POLICY & DECISION MAKING**	**GLOBAL ACCESS TO SAFE WATER**
Concurrent Session 1 1:15 PM	**Regional Trends in EWFN Science and Research Enterprise** Focuses on developing science-based solutions, its application, and the research that make EWFN possible	**EWFN Climate Change Impacts** Focuses on climate change mitigations that promote business and energy production and technologies affecting EWFN systems under a changing climate	**Enabling EWFN Workforce Development and Student Training** Provides solutions to national security and global challenges creating the need for a well-trained workforce in EWFN	**Innovative Solutions for Safe Water and Health** Seeks to maximize collective efforts that ensures that communities have access to secured and safe drinking water
Panelist 1	**Elizabeth Lewis** FAMU School of Architecture and Engineering Technology	**Andre Dobos** University of Miskolc, Hungary	**Felicia Davis** Clark Atlanta University	**Nathaniel Bailey** FAMU, College of Agriculture and Food Sciences
Panelist 2	**Richard Gragg** FAMU School of Environment	**Andrew Philipps,** City of Orlando	**Charles Jagoe** FAMU School of Environment	**Isabel Escobar** University of Kentucky
Panelist 3	**Sheril Murray Powell** Minardi Law Stuart, FL	**Lucy Ngatia** FAMU, College of Agriculture and Food Sciences	**Adrienne Cooper** Bethune-Cookman University	**Tamás Madarász** University of Miskolc, Hungary
Panelist 4	**Makhosi Buthelezi** Mangosuthu University of Technology, South Africa	**Tulio Chavez-Gil,** Coppin State University	**Busisiwe Mandleni** Mangosuthu University of Technology, South Africa	**Sandiso Ngcobo** Mangosuthu University of Technology, South Africa
Session Moderators	**Arpad Palotas** University of Miskolc, Hungary	**Kome Onokpise** FAMU, College of Agriculture and Food Sciences	**Nokware Adesegun.** Attorney/Consultant Atlanta, GA	**Tamás Madarász** University of Miskolc, Hungary

Tracks	SCIENCE ENTERPRISE	ACCELERATED INNOVATION	SCIENCE BASED POLICY & DECISION MAKING	GLOBAL ACCESS TO SAFE WATER
Concurrent Session 2 2:45 PM	**Advancing EWFN Data Networks** Focuses on how to integrate EWFN systems	**EWFN Integrated Systems, Market and Business Solutions** Focuses on how to integrate EWFN systems, capital and new markets for advancing EWFN businesses	**Connecting & Mobilizing Global Communities in EWFN Policies** Advancing best practices and policy drivers critical to achieving a sustainable EWFN in global communities with a discussion on local policies that will enable rural communities to be successful in EWFN enterprise	**Innovations in Water Re-Use** Discusses new approaches and innovations to wastewater re-use
Panelist 1	**Reginald Archer** Tennessee State University	**Ennis Jacobs** Attorney, City of Tallahassee and FAMU	**Steve Brown** Seed2Source, Orlando Florida	**Ifetayo Venner** Arcadis, Water Environment Federation
Panelist 2	**Makhosi Buthelezi** Mangosuthu University of Technology, South Africa	**Reis Alsberry** FAMU Technology Transfer	**Jennifer Waxman-Loyd** Sustainable Synergy Inc. and Seed2Source, Orlando Florida	**Ashvini Chauhan** FAMU School of Environment
Panelist 3	**Christy Crandall** FAMU, College of Agriculture and Food Sciences	**Sundiata Ameh-El** Tallahassee Food Network, Florida	**Mark Nathan** Violet Defense Technology, Celebration, Florida	**Csaba Ilyés** University of Miskolc, Hungary
Panelist 4	**Tshepiso Makhafola** Mangosuthu University of Technology, South Africa	**Jerry Comellas,** University of South Florida Tampa, FL	**Glenn Harrington** U.S Environmental Protection Agency Washington, DC	**Karabo Shale** Mangosuthu University of Technology, South Africa
Session Moderators	**Nathaniel Bailey** FAMU, College of Agriculture and Food Sciences	**Thomas H. Culhane** Solar C^{3}ITIES and University of South Florida Tampa, FL	**Erik Ness** National Renewable Energy Laboratory/ Clean Energy Solutions Center, Colorado	**Jennifer Daw** National Research Energy Laboratory, Colorado

THE CHANGES OF THE HYDROLOGICAL CYCLE INSIDE THE CARPATHIAN-BASIN

Csaba Ilyés – Dr. Endre Turai – Prof. Dr. Péter Szűcs

Institute of Environmental Management, Faculty of Earth Science and Engineering, University of Miskolc

MTA-ME Research Group of Geoengineering

19-20 October 2017. Orlando, FL, USA

FAMU ENERGYWATERFOODNEXUS International Summit 2017

INTRODUCTION

- Growing number of extreme weather conditions
- Connected to the hydrological cycle
- Huge amount of rainfall in a short time period
  - Meaning longer periods without any measurable rain
  - Fast floods, karstic floods
  - Urban floods
- In Hungary these can cause several problems

Photos: Dr. László Lénárt

INTRODUCTION

- Fast-floods of Miskolc 2006, 2010, 2013
- In Hungary inland water and drought can be at the same place
- These extremities affect the agriculture, food industry and energy usage through irrigation
- With the proposed mathematical methods the variability of the rainfall events
- Conceptual changes in groundwater management
    - Not to let the water surpluss go (floods) through fast, but to store the large amount of water

Photos: Dr. László Lénárt

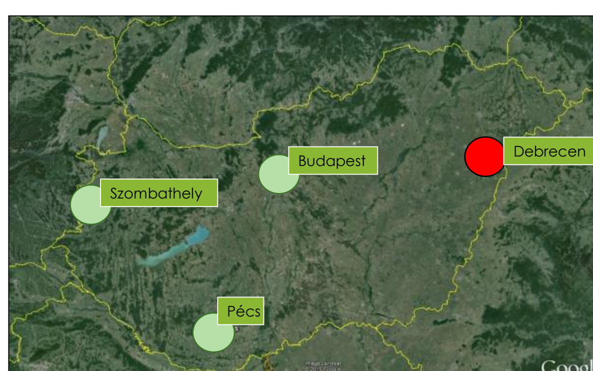
INTRODUCTION

- On Earth approximately 400 000 km^3 volume of water is being transported annually in the water cycle.
- Which is affected by the changing climate and the meteorological extremities present in recent years.
- These changes in the behaviour of precipitation have an impact on the groundwater resources through the recharge, so we chose to investigate the precipitation
- In Hungary most of the drinking-water is produced from GW resources (96%)

WHERE ARE WE?

METHODS & MATERIALS

- Hungarian Meteorological Service Online Database – official measurements
- Cyclic properties of 110 year long data of annual and mothly rainfall
- Forecasting
- Wavelet-analysis



METHODS & MATERIALS

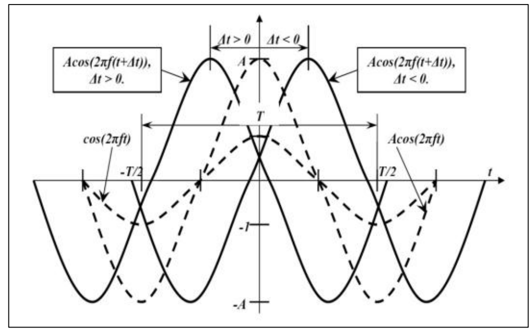
$$\cos(t) = \cos\left(\frac{2\pi}{2\pi}t\right) = \cos\left(\frac{2\pi}{T}t\right) = \cos\left(2\pi\frac{1}{T}t\right) = \cos(2\pi f t)$$

$$f = \left(\frac{1}{T}\right)$$

Where, f :frequency,
$T=2\pi$: period length

$$A * \cos(2\pi f t + \varphi)$$

Where, A :amplitude,
φ: phase angle



$$F(f) = A(f)e^{j\Phi(f)}$$

Fourier-spectrums based on the *cos(2πft)* and *sin(2πft)* functions.

$$Re[F(f)] = \int_{-\infty}^{+\infty} f(t)\cos(2\pi f t)\,dt$$

$$Im[F(f)] = \int_{-\infty}^{+\infty} f(t)\sin(2\pi f t)\,dt$$

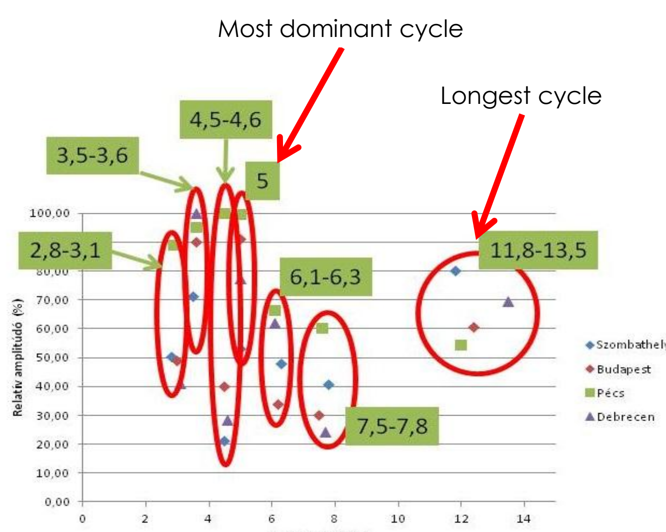
The real and imaginary spectrum gives the weights of the sin-cos components.

Search for periodic components in *y(t)* precipitation functions.

ANNUAL DATA

- Annual data:
  - Time span: 1901-2010
  - Time length: 110 years
  - Sampling rate: 1 year

- Budapest: 21 cycles
- Debrecen: 18 cycles
- Pécs: 17 cycles
- Szombathely: 20 cycles



MONTHLY DATA

Most dominant cycles

- Monthly data:
  - Time span: Jan. 1901- Dec. 2010
  - Time length: 1320 months
  - Sampling rate: 1 month
- Budapest: 71 cycles
- Debrecen: 43 cycles
- Pécs: 65 cycles
- Szombathely: 19 cycles

DAILY DATA

Longest cycle [day]	Budapest	Debrecen	Pécs	Szombathely
1. January 1901. – 1. January 1956.	7998	5753	5157,5	3724
1. January 1956. – 31. December 2010.	6424	4654,5	3605	2789,5
Change in the period of time [day]	**-1574**	**-1098,5**	**-1552,5**	**-934,5**

Longest cycle [mm/365/day]	Budapest	Debrecen	Pécs	Szombathely
1. January 1901. – 1. January 1956.	1139,7566	795,8804	739,9553	724,1627
1. January 1956. – 31. December 2010.	581,1618	637,4869	597,1862	532,4286
Change in the relative amplitude spectrum	**-49,01 %**	**-19,9 %**	**-19,29 %**	**-26,48 %**

ACROSS THE CARPATHIAN-BASIN

From annaul precipitation [yr]	$\frac{A(T)^{lok}_{max}}{A(T)^{abs}_{max}}$	From monthly precipitation [month]	$\frac{A(T)^{lok}_{max}}{A(T)^{abs}_{max}}$
5	80,17 %	1	94,16 %
3,5-3,6	71,25 %	0,5	61,97 %
11,8-13,5	66,11 %	4,92-5,00	28,61 %
2,8-3,1	57,27 %	1,13-1,15	23,14 %
6,1-6,3	52,36 %	1,2-1,21	23,08 %
4,5-4,6	47,36 %	3,42-3,67	22,83 %
7,5-7,8	38,79 %	0,4-0,43	22,76 %
		2,36-2,39	21,85 %
		4,17-4,50	20,88 %
		11,75-13,67	19,34 %
		2,8-3,17	17,35 %
		6,08-6,25	15,21 %
		7,58-7,67	10,56 %

- From the four examined stations

- 7 cycles from annual
- 13 cycles from monthly

FORECASTING - THEORETICS

- With the *A(f)* amplitude spectra and the *Φ(f)* phase spectra, the original measured data can be recalculated:

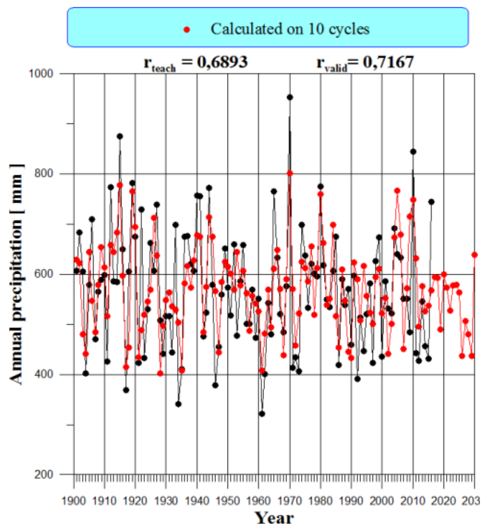
$$y(t) = \bar{Y} + \int_0^{+f_N} A(f) e^{j[2\pi f t + \Phi(f)]} df$$

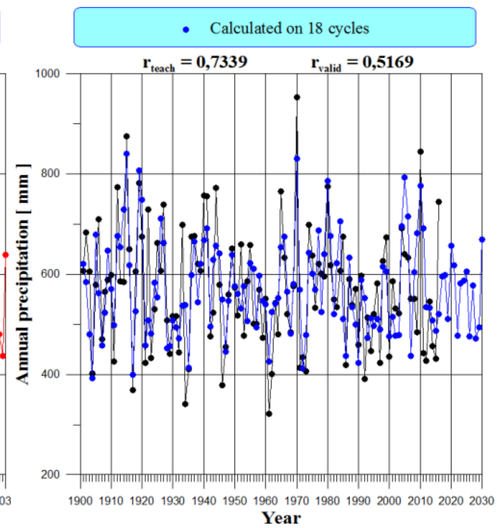
- With the major and minor cycles, and their period of time, amplitude and phase spectra values, the deterministic precipitation time series can be calculated:

$$y(t)^{det} = \bar{Y} + \frac{2}{T_{reg}} \sum_{i=1}^{18} A_i \cos\left[\frac{2\pi}{T_i}(t-1901) + \Phi(T_i)\right]$$

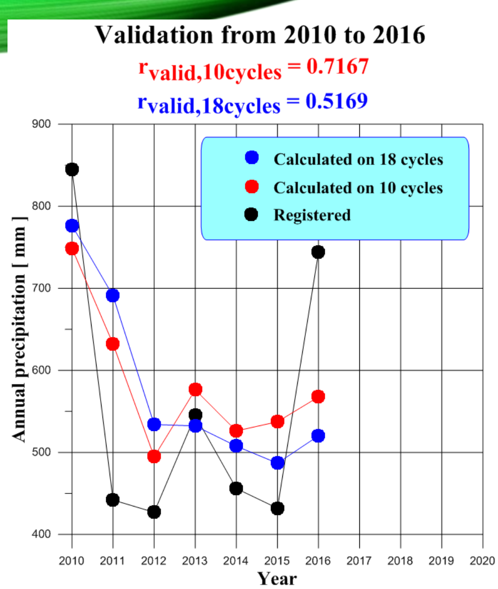
FORECASTING

- 10 major cycles
- R=0,6893
  - Medium correlation
- All 18 cycles
- R=0,7339
  - Storng correlation





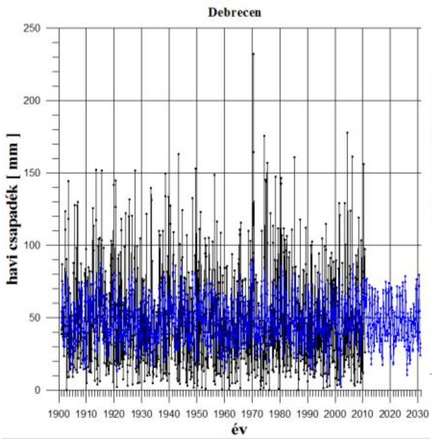
FORECASTING



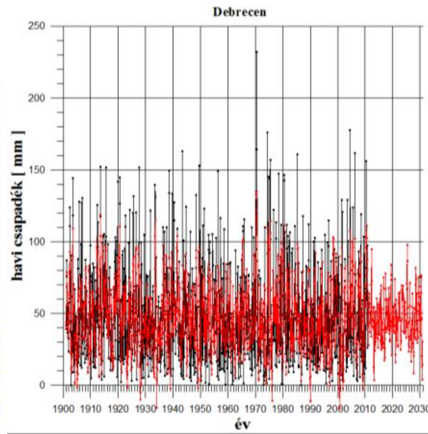
Date	Registered	10 cycles	18 cycles
2010	845	748.9	776.7
2011	442	632.2	690.8
2012	427	494.7	534.0
2013	545	576.3	532.3
2014	456	526.4	507.6
2015	432	537.4	486.8
2016	744	567.6	520.2

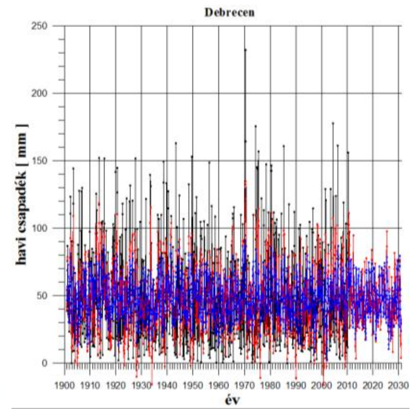
FORECASTING

15 cycles
R=0,4735



164 cycles
R=0,6237



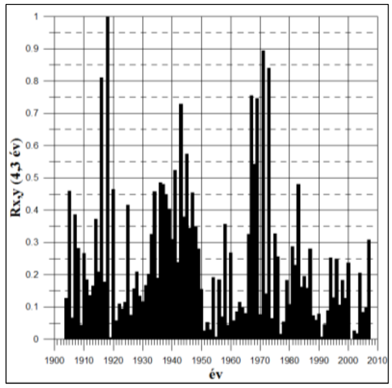


WAVELET ANALYSIS

- Wavelet time series analysis is a well-known method to investigate the time-dependence of a cycle within a time series.
- The periodic components from the previous examinations were used for this analysis.
- The wave packet used for the calculation was a 1 year long period of time sine wave.

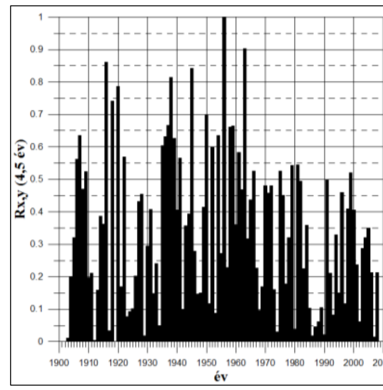
WAVELET ANALYSIS

- Local Maximum:
  - Debrecen
    - 1956, 1963, 1916, 1945 and 1938
  - Pécs
    - 1918, 1971, 1973 and 1916
- Local Minimums:
  - 1910's, 30's and in the 70's

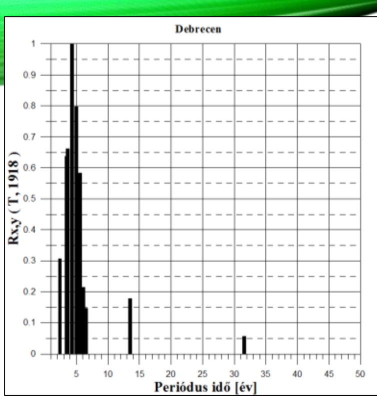


Debrecen

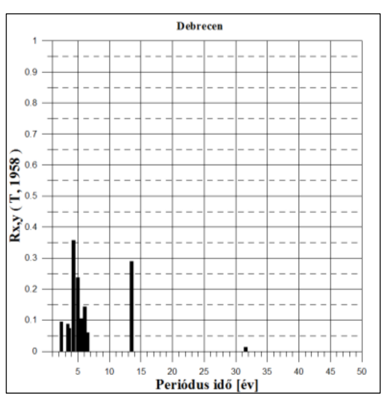
Pécs

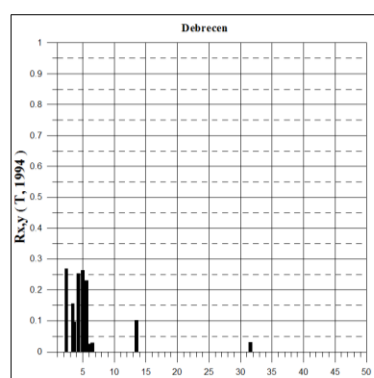


WAVELET ANALYSIS



Time-dependence in Debrecen Hungary





CONCLUSIONS

- The method can be useful to identify cycles in a dataset, such as precipitation
- Reducing the variability of a rainfall event
- The water-management or groundwater-managementcan be more planned

- Several cycles calculated from long-term rainfall timeseries'
- Both locally and country-wide
- From these cycles forecasting can be calculated
- Future:
  - Connection with the shallow groundwater.
  - Calculating the time lag between rainfall cycles and groundwater.

ACKNOWLEDGEMENTS

The research was carried out within the GINOP-2.3.2-15-2016- 00031 "Innovative solutions for sustainable groundwater resource management" project of the Faculty of Earth Science and Engineering of the University of Miskolc in the framework of the Széchenyi 2020 Plan, funded by the European Union, co-financed by the European Structural and Investment Funds.

THANK YOU FOR YOUR ATTENTION!