3rd STAHY International Workshop on Statistical Methods for Hydrology and Water Resources Management

Round Table:

The Legacy of Vít Klemeš to hydrological sciences

Tunis – Tunisia, 1-2 October 2012

Vít Klemeš: Lessons of Vitality

Demetris Koutsoyiannis

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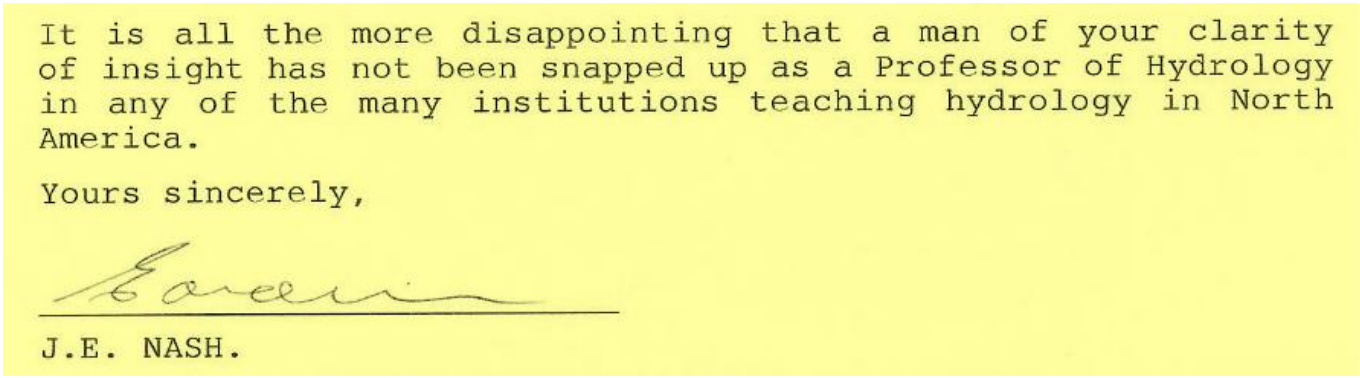
Presentation available online: itia.ntua.gr/1281/

An Appendix to Vít's CV: Awards

- 1993: Gold Medal from the Slovak Academy of Sciences.
- 1994: International Hydrology Prize jointly awarded by the International Association of Hydrological Sciences (IAHS), the United Nations Educational Scientific and Cultural Organization (UNESCO) and the World Meteorological Organization (WMO).
  - Statement by the then IAHS President, Uri Shamir: "*He has been known in the hydrological community as one 'who keeps us honest' and one 'who tells it like it is' without being blinded by passing fashions and flashy new technologies*".
- 1995: Ray Linsley Award from the American Institute of Hydrology.
  - Citation by David R. Dawdy: "*I have always prided myself on being the curmudgeon of hydrology, so it is with much regret that I must bestow on Vít the title of Chief Curmudgeon of Hydrology as well as the Ray Linsley Award*".

An Appendix to Vít's CV: Other recognitions

- 1987: Letter by J. Eamonn Nash:

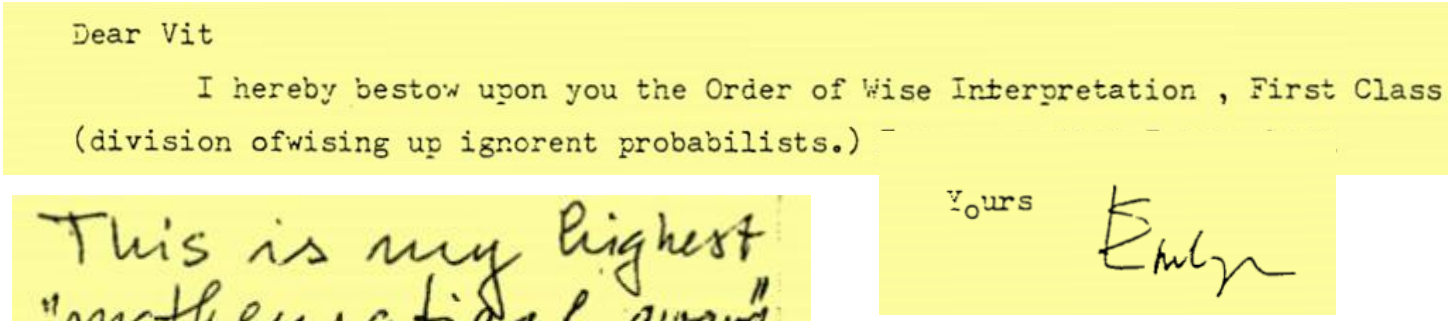


It is all the more disappointing that a man of your clarity of insight has not been snapped up as a Professor of Hydrology in any of the many institutions teaching hydrology in North America.

Yours sincerely,

J.E. NASH.

- 1992: Aspen Global Change Institute: 1992 Summer Session Presentation Award to Dr. Vít Klemeš for: **Courageous and Continuous Use of Pins Against Balloons** (see Klemeš, 2011, p. 311).
- 1994: Letter by Emlyn Howard Lloyd and Vít's comment:



Dear Vit

I hereby bestow upon you the Order of Wise Interpretation , First Class (division ofwising up ignorent probabilists.)

Yours Emlyn

This is my highest "mathematical award" ever received.

Dissent 1: The Hurst phenomenon

Dr. D. Koutsoyiannis
Department of Water Resources
School of Civil Engineering
National Technical University of Athens
GR-15780 Zographou
Greece

Victoria BC, 8 August 2003

Dear Professor Koutsoyiannis:

Some time last year, your paper on "The Hurst phenomenon and fractional Gaussian noise made easy" (*HSJ*, **47**, 4, 2002) was brought to my attention by a friend who asked me about my opinion about it. I could not answer his question since, because of my resolution to stop reading and writing about the science of hydrology by the end of the XXth century, I had not read your paper. However, when, by chance, I recently came across the above issue of *HSJ* in the office of another friend, my curiosity was aroused and, making an exception, I now have read the relevant part of your paper and formed an opinion about your allegedly new "simple explanation". I am reprinting it below from a letter to my friend because it has been my practice not to gossip about others behind their back and to limit my comments to those which I would not hesitate to tell them directly.

Sincerely yours,

V. Klemes
3460 Fulton Rd., Victoria BC, V9C 3N2, Canada

Encl.: Annotated reprint of *WRR*, **10**, 4, 1974.

The Hurst phenomenon: A closer look

WATER RESOURCES RESEARCH AUGUST 1974

To Dr. Koutsoyiannis
Without compliments
V. Klemeš
8 Aug. 2003

The Hurst Phenomenon: A Puzzle?

V. KLEMEŠ

Hydrology Research Division, Inland Waters Directorate, Environment Canada, Ottawa, Ontario

It is shown that the Hurst phenomenon is not necessarily an indicator of infinite memory of a process. It can also be caused by nonstationarity in the mean and by random walks with one absorbing barrier, which often arise in natural storage systems. Attention is drawn to the fact that inferences about physical features of a process, based on operational models, can be not only inaccurate but grossly misleading.

Up: Klemeš (1974) with dedication to DK.

Right: Koutsoyiannis (2002)—an extract.

The Hurst phenomenon and fractional Gaussian noise made easy

DEMETRIS KOUTSOYIANNIS

The above explanation may seem similar (from a practical point of view) to that by Klemeš (1974), who attributed the Hurst phenomenon to nonstationary means. However, there is a fundamental difference here. As shown in the above analysis, it was not assumed that means are nonstationary, but rather, that they are randomly varying on several scales. Nonstationarity of the mean would be the case if there existed a deterministic function expressing the mean as a function of time. In some

Two extracts form Vít's paper (highlight by Vít)

Indeed it is the very success of an operational model that by diverting further attention from the problem, often delays a satisfactory explanation and understanding of the modeled phenomenon. There are many examples in the history of science to support this thesis. One of the most warning ones is that of the Ptolemaic planetary model. It was exactly because it 'worked' so well (its predictions of positions of stars were more than accurate enough for the contemporary needs) that it hampered progress in astronomy for centuries. Fortunately,

tail). Equally interesting is the apparent contradiction between the stationarity of fBn and the nonstationarity of the process with a fluctuating mean. There is, in fact, no contradiction because the process employed in the last set of experiments, although it was nonstationary by definition, can well be considered stationary in the sense that 'its probability laws do not change through time' [*Hannan*, 1960]. It abides by

The Greek symposia and the Socratic dialogue

Vít's email as of 01/01/2005:

"In order that we leave the old one behind and this year try to continue our discussion in some more productive way. It occurs to me that we could sort out most of our differences, misunderstandings, etc. in one or two afternoon chats of a direct 'Socratic dialogue' in which one can interject the argument immediately when one has an objection or doesn't exactly understand what his counterpart means, etc."

Continuation of the Socratic dialogue: Island of Cephalonia, Greece

The end of the symposium

- Vít scored a victory and was crowned with laurels.
- DK took consolation by smoking a cigarette.

A simple solution* of the Hurst puzzle

- All analyses aiming to detect the presence of the Hurst phenomenon in a time series tacitly assume **stationarity**, where the term is meant with its rigorous meaning in stochastics rather than the colloquial one.
- All mathematical processes that generate time series reproducing the Hurst phenomenon assume **stationarity.**
- Visualization of any, natural or synthetic, time series with Hurst behaviour reveals that **local means can vary strikingly** and depart considerably from global mean; this distinguishes them from purely random series.
- Thus, the Hurst phenomenon is identical with **change** at all time scales; this change is irregular and should not be viewed as "nonstationarity".

* Vít would perhaps agree (at least partly) with this "solution"; see his own comment in http://landshape.org/enm/?p=25

A simple solution of the Hurst puzzle (contd.)

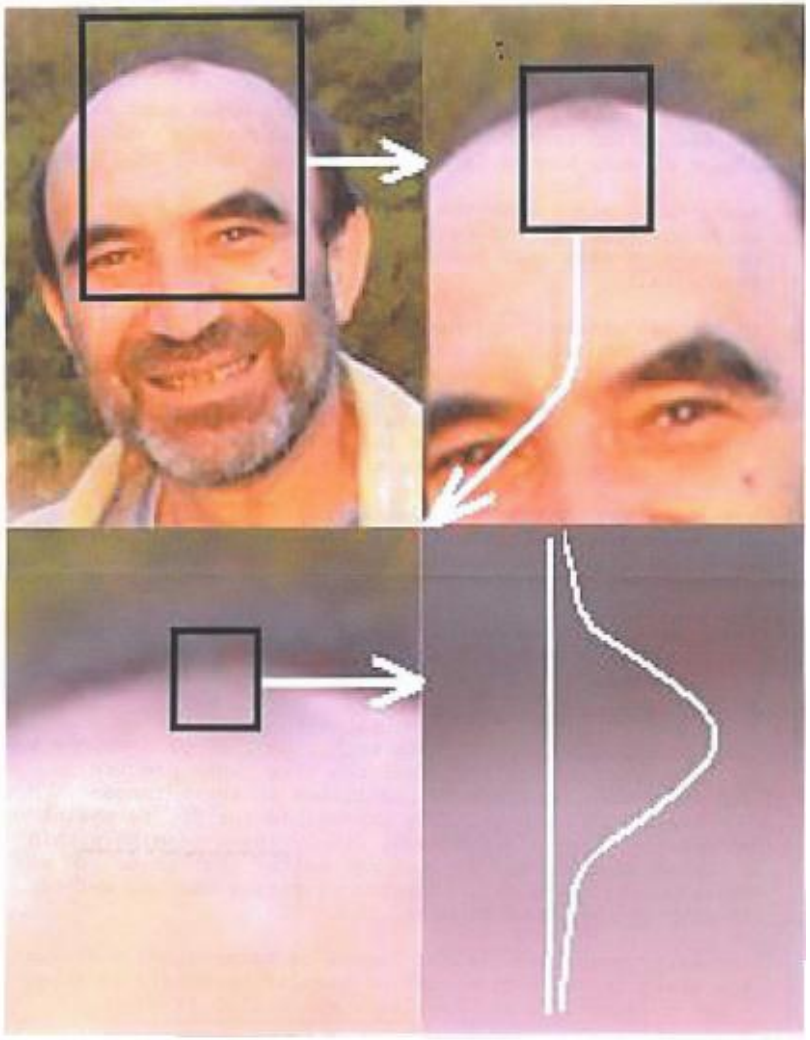
- In a stationary setting, this **change implies** high **autocorrelation** coefficients (indicating stochastic dependence) at all lags and at all scales; these are thus one of the effects of change and not a mechanism responsible for the emergence of the Hurst behaviour.
- It is unfortunate that autocorrelation has been interpreted as "**memory**" and that, in turn, this "memory" has been commonly regarded as the most important characteristic of the Hurst behaviour, so important as to give it the misleading names "**long memory**" and "**infinite memory**" (after Mandelbrot).
- It is even more unfortunate that 60+ years after the identification of the Hurst behaviour and almost 40 years after Klemeš's paper the term "**long memory**" is still the most common name of this behaviour.

Dissent 2: On improbability and impossibility

The following extract from Feller (1950) provides the background of this discussion; the part in red has been quoted by Vít (Klemeš, 1997)

We hesitate to admit that man can grow 1000 years old, and yet current actuarial practice admits no bounds to the possible duration of life. According to formulas on which modern mortality tables are based, the proportion of men surviving 1000 years is of the order of magnitude of one in $10^{10^{36}}$ —a number with 10^{27} billions of zeros. **This statement does not make sense from a biological or sociological point of view, but considered exclusively from a statistical standpoint it certainly does not contradict any experience.** There are fewer than 10^{10} people born in a century. To test the contention statistically, more than $10^{10^{35}}$ centuries would be required, which is considerably more than $10^{10^{34}}$ lifetimes of the earth. Obviously, such **extremely small probabilities are compatible with our notion of impossibility.** Their use may appear utterly absurd, but it does no harm and is convenient in simplifying many formulas. Moreover, **if we were seriously to discard the possibility of living 1000 years, we should have to accept the existence of maximum age, and the assumption that it should be possible to live *x* years and impossible to live *x* years and two seconds is as unappealing as the idea of unlimited life.**

Vít's treatise on men's height



Victoria BC, 30 July 2005

Dear Demetris,

Attached, you will find a treatise on my experiment with the transition from 'improbable' to 'impossible' which, as I have already hinted, you may repeat to verify my result.

However, to stick with the 'height of a person' example, I am going to try something that you may find more personally relevant. I make only one assumption: that you are about 190 cm tall.

In the USA persons' heights are rounded to whole inches and, for instance, your driver's license would give your height as 6'3". In Canada heights are rounded to whole centimeters, so 6'3" would be converted to 190 or 191 cm. The 'correct' value might be difficult to decide, because it could be closer to one or the other, depending if your measurement were taken in the morning or in the evening.

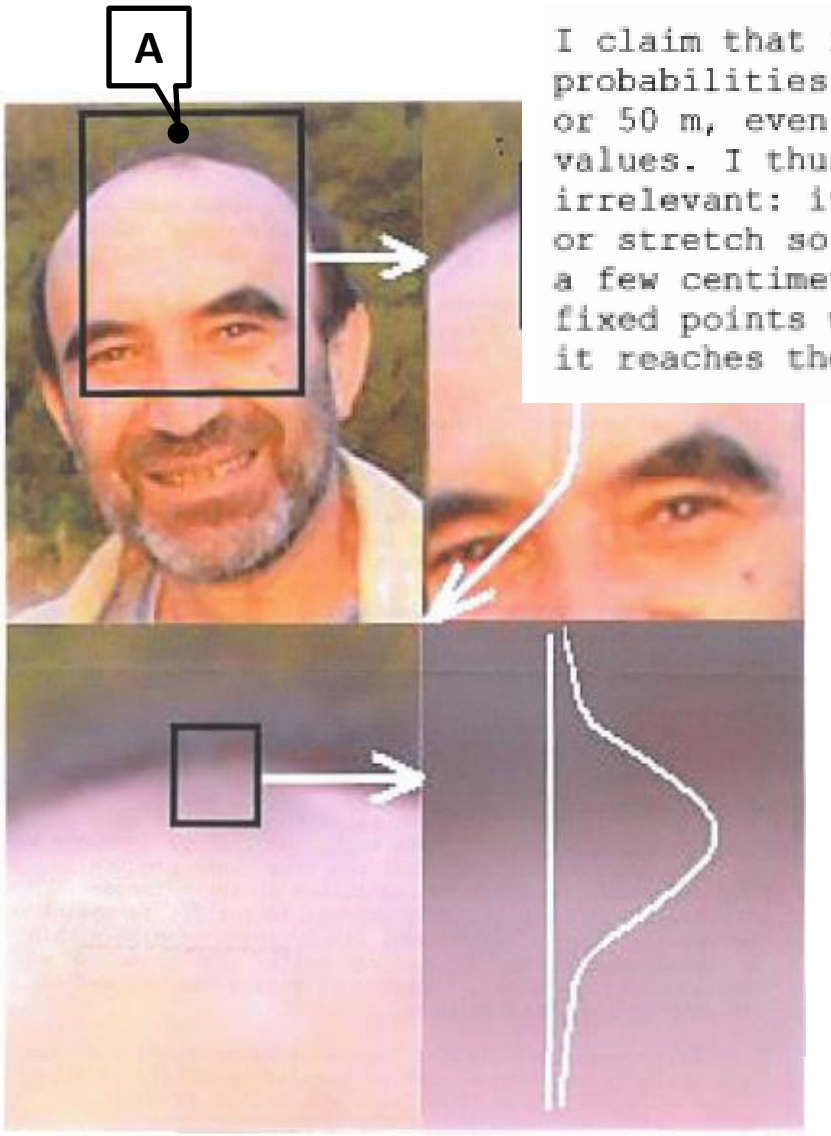
But let's say that some perfectionist country would try to give persons' heights in microns and go about it really scientifically: they would take a large number of your measurements (with an electron microscope, I suppose) and would come up with a histogram, because the measurements would vary depending on the temperature, your breathing, etc. Then they would fit a distribution model (it probably would be Normal) and take its average as the 'true' value.

I claim that it would make no sense to 'estimate' probabilities of your heights being, say, 50 or 5 cm, or 5 or 50 m, even though the model can give their precise values. I thus consider probabilities in those ranges irrelevant: it is physically impossible for you to shrink or stretch so much – the model simply loses meaning within a few centimeters and it does not matter that there are no fixed points where this happens: it surely does so before it reaches the above figures.

Actually, your exact height cannot be ascertained even for any given specific time instant when it obviously is fixed – see my demonstration overleaf, which also (I hope) demonstrates my above point.

With kind regards to you and Anna,

DK's view on Vít's treatise on men's height



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- Point A is higher than DK's head because we can see the tree behind DK.
- This sets an upper bound to DK's height.
- So Vít's probability density function on the left should be bounded from above.
- With a similar argument we can conclude that it is also bounded from below.
- Conclusion: No inconsistency between probability theory and common sense.

A relevant email exchange

- On 18/03/2007 08:27, Vít Klemeš wrote:
  - So far the two buffers … should keep me in a reasonable distance from ['strange attractors'] for a while, seem to be working and the only visible side effects are that I am now buying more expensive wine … (**of course, I also reconfirmed my reservation on cloud No.17**).
- On 18/03/2007 22:03, Demetris [& Anna] Koutsoyiannis wrote:
  - We too think that loving good things such as good wine is the best remedy. So, we hope you will decide to enjoy them and your family for a long time. **Cloud 17 can wait. Besides, this is the ultimate destination for all of us.** But, meanwhile we hope to see you healthy soon, perhaps in Perugia.
- On 19/03/2007 20:33, Vít Klemeš wrote:
  - I am glad that, for once you seem to accept my position and don't say "this is the 99.9999999999...% sure destination for 99.9999999999...% of us".
- On 19/03/2007 23:46, Demetris Koutsoyiannis wrote:
  - No need to change my formulation. I said "ultimate" which means time tends to infinity. In this case the probability is exactly one.
- On 20/03/2007 02:45, Vít Klemeš wrote:
  - Given the physical context, this is exactly what I wanted to hear: "In this case the probability is exactly one." – not 99.99999...%.

Vít Klemeš contributions in the 21st century

Books

- Common Sense and Other Heresies (2000; second edition 2011)
- An Imperfect Fit (2004)

Journal papers

- Apocrypha, or "things that are hidden" (*Hydrological Sciences Journal*, 2008).

Conference presentations

- There is more to the Vltava River than its 175-year long streamflow record (Minnesota, 2001).
- Some thoughts about stochastic hydrologic modelling inspired by the Canadian wilderness (Athens, 2005).
- 20 years later: What has changed – and what hasn't (Perugia, 2007a).
- An unorthodox physically-based stochastic treatment of tree rings (Perugia, 2007b)
- Political pressures in water resources management: Do they influence predictions? (Prague, 2008).

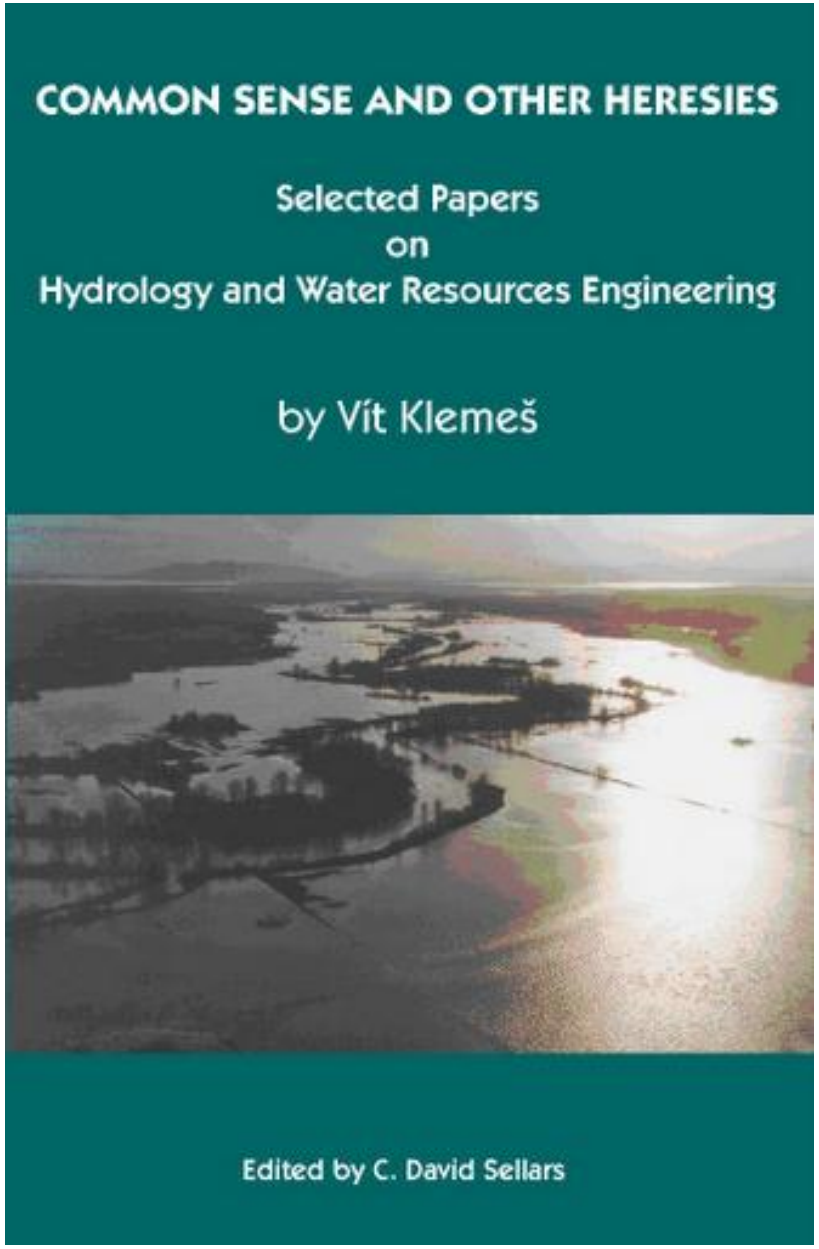
Other (unpublished)

- Scaling versus Hurst (2004).
- Comments on Maltese 'cart tracks' ('cart ruts') (2005).
- A treatise on probability, improbability, impossibility (2005).

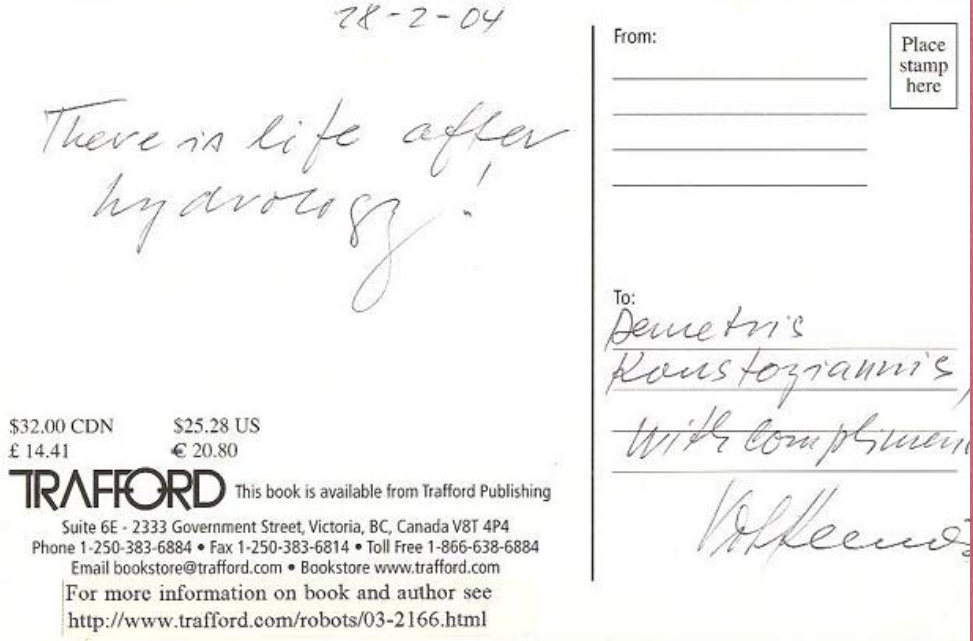
“Common Sense and Other Heresies”

Why the book should be read:

- It is not written in a conformist style and it does not repeat known things.
- It contains stuff to agree with and to disagree with.
- The author adopts a pragmatic engineering approach.
- He is as courageous as to use common sense (instead, e.g., of trying to be politically correct).
- He suggests that being heretic in science is a positive qualification.



"An Imperfect Fit"


28-2-04

There is life after hyaroug!

From:

Place stamp here

To:
Demetris
Koutsoyiannis
With compliments
V. Klemeš

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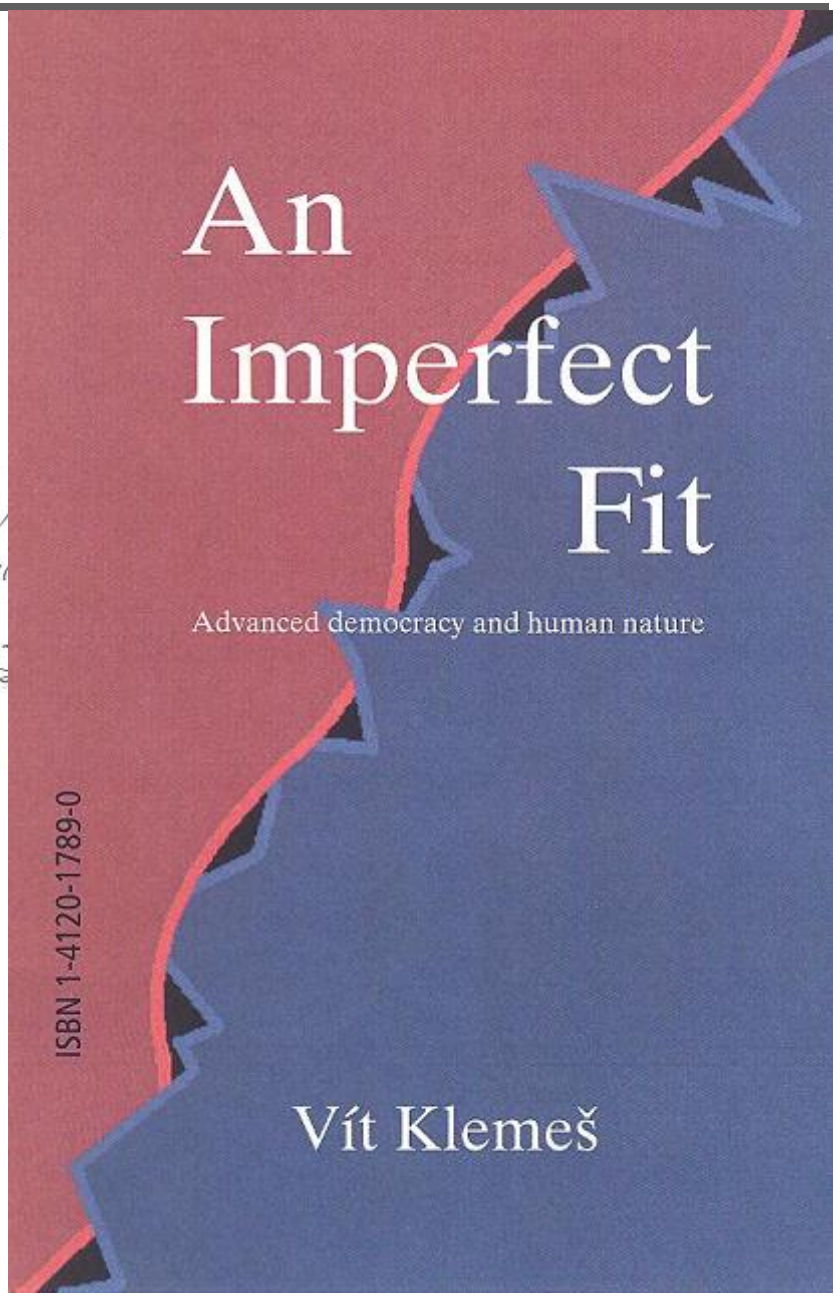
One extract:

The more the reality diverges from the way prescribed by the ideology, the more ruthlessly it is forced in the prescribed channels and the more brutal are the means by which the noble ends are pursued.



From "Apocrypha"

- Vít quoting a letter by Ken Duffy (Irish mathematician):
  - *"One such famous dataset was a digitised version of the Star-wars film... Within a space battle, a lot of information is transmitted, within a love scene little is sent. ...Unfortunately the community of tele-traffic engineers are still more aware of the long range dependence work than the suggestion that the phenomenon can be explained by non-stationarity."*
- Conclusion by Vít:
  - *"Well, now at last I can better understand why my Hurst paper didn't have much impact in hydrology: it surely is easier to visualize physically caused 'level-shifts' between space battles and love scenes than it is between runoff in different time periods."*

From "20 years later:* What has changed … "

"[A] new infectious disease has sprung up—a WATER-BORN SCHIZOPHRENIA: on the one hand, we are daily inundated by the media with reports about water-caused disasters, from destructive droughts to even more destructive floods, and with complaints that 'not enough is done' to mitigate them and, on the other hand, attempts to do so by any ***engineering means—and so far no other similarly effective means are usually available****—are invariably denounced as 'rape of nature' (often by people with only the foggiest ideas about their functioning), and are opposed, prevented, or at least delayed by never ending 'environmental assessments and reassessments'. In the present 'green' propaganda, all dams are evil by definition, ranking alongside Chernobyls, Exxon Valdezes, 'rape of the environment', AIDS, cancer and genocide".*

* Note that 20 years earlier, Klemeš (1986, 1987) supported the vision of hydrology as a science independent of engineering and asserted that cutting the umbilical cord between the two would be beneficial for both.

From "20 years later: What has changed …" (contd.)

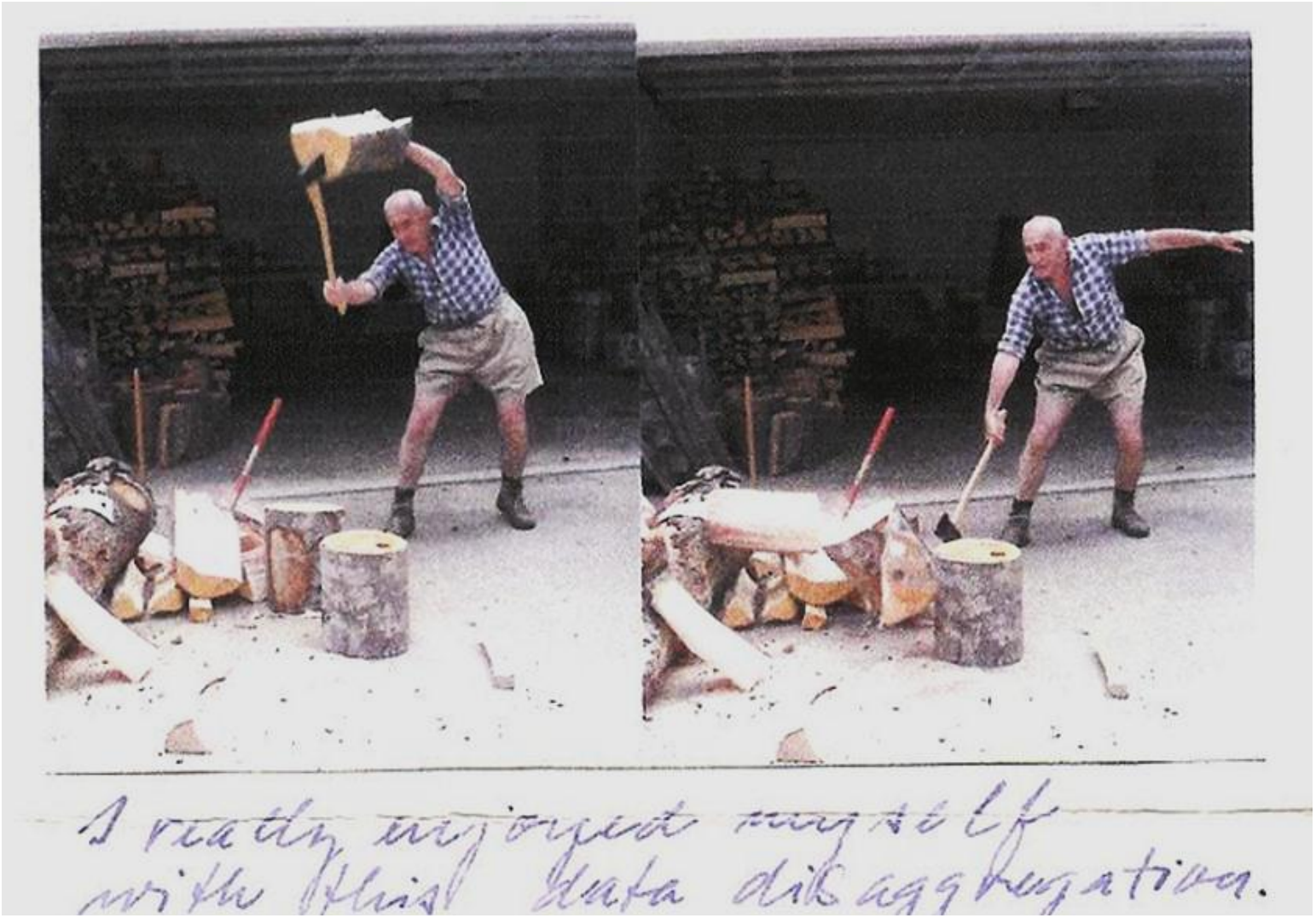
"I shall close with a plea to all of you, ***hydrologists and other water professionals, to stand up for water, hydrology and water resource engineering****, to restore their good name, unmask the demagoguery hiding behind the various 'green' slogans. As in any sphere of human activity, errors with adverse effects were and will be made in our profession as well (think of the human toll of errors made in the medical profession – and nobody is vilifying hospitals and advocating tearing down medical clinics). But, on the whole, our profession has nothing to be ashamed of—from the times of the ancient Mesopotamia, Greece and Rome to the present, it has done more good for mankind than all its critics combined. This is not a revelation: this is a historical fact. So, be brave, be proud, be heretics if necessary, and above all, use your common sense".*

From his "unorthodox physically-based stochastic treatment of tree rings"

13 Data disaggregation

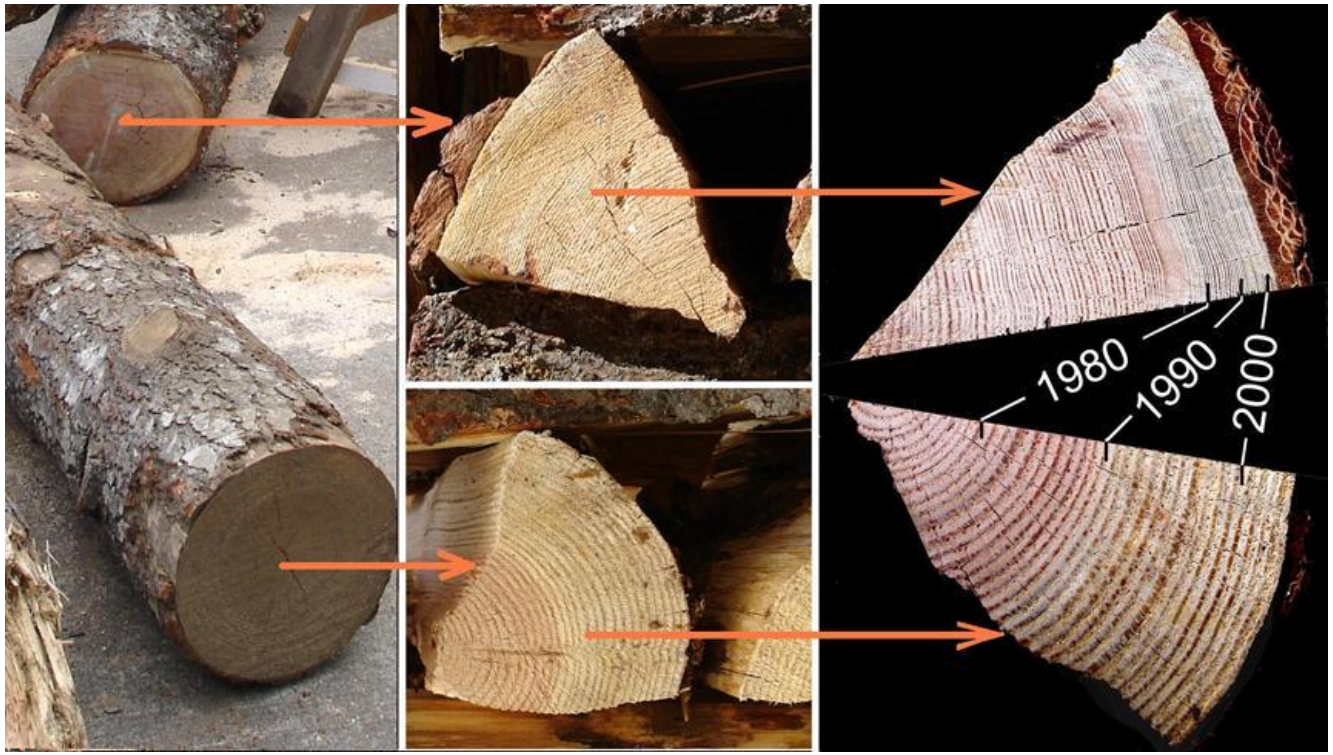
The task accomplished, I proceeded to data disaggregation which was one of the high points of the exercise, and definitely most fun.

From an initial draft of the presentation (letter form, 2006-07-01)



19 - Climate change

This remarkable fact must have escaped the notice of theorists using tree-ring series as proxies for the reconstruction of past climate since otherwise it would have made front-page headlines: for it provides an unambiguous proof that two (or perhaps more?) different climates can peacefully coexist in parallel a mere stone throw apart-at least in our neighborhood on 'Triangle Mountain' in Victoria, British Columbia.



The last talk: "Political pressures in water resources management: Do they influence predictions?"

[P]olitical pressures often set the agenda for what is to be (or not to be) predicted, and sometimes even try to impose the prediction result thus transforming prediction into prescription.

...

Well, how anybody in his right mind could propose wasting precious resources on such petty things when political pressures command their use for the noble cause of saving the planet from Climate Change? But, could it not be that the present climate-change-impact models and all sorts of Al-Gore-ithms aimed at helping this noble cause will repeat the history of the noble causes of the past, like the previously mentioned environmental quality models or the ill-fated 'socialist model' meant to save the planet by imposing a 'climate change' on the social fabric itself?

An anecdotal* exchange with the Canadian Geophysical Union's (CGU)

- On the occasion of 2009 Copenhagen Conference, the Canadian Geophysical Union's (CGU) circulated the Climate Change letter (http://gccdebate.com/letter-to-canadian-parliment-nov-29th-2009-for-climate-change/) which was addressed to the Government and Parliament of Canada with a request to sign it.
- The letter begins as "At the Copenhagen Conference of the Parties to the UN Framework Convention on Climate Change, the eyes of the world will be on Canada. We, the leaders of the following Canadian scientific societies, urge the Government to negotiate an outcome that will rapidly and adequately address climate change."

* Vít emailed his reply to DK; since it bears Vít's signature, DK felt that he had his consent from "cloud 17" to make it public (http://motls.blogspot.gr/2011/03/vit-klemes-1932-2010.html).

Vít's answer to CGU

20.11.09

My answer is NO

Reasons: The Draft reads like a document prepared by an alarmist pressure group, not by a scientific institution. First of all, the introductory statement is rather arrogant in its exaggeration of Canada's importance in the world. Such self-promotion can only hurt Canada's image. **The term 'climate change' is a misleading popular slogan**. Climate has never been stable but has been, and will continue to be, changing, regardless of human interventions. The issue is the rising temperature as is after all obvious from the second paragraph where all the effects listed refer to temperature rise. The first sentence of the second paragraph should thus be reformulated accordingly. Moreover, "Some current and anticipated impacts..." would me a more honest statement. **The statement "...that greenhouse gases resulting from human activities have contributed to the warming of the atmosphere..." is trivial - even Suzuki's and Al Gore's farts "contribute" to it.** No "rigorous international research" is needed to establish this. The issue is that human contribution has not yet been rigorously quantified and, until it is, nobody can tell how "serious risk" it represents.

Vít's answer to CGU(contd.)

It is the quantification of the various effects where rigorous research is needed and where Canada could perhaps make some contribution. The statement "Human activities must be optimized to significantly reduce emissions..." is logically inconsistent. One cannot prejudge that "optimization" of human activities (whatever that is) will necessarily require a "significant" reduction of emissions. Given the finite resources, "optimization" must balance the economy with the management not only of CO2 emissions but of other environmental pollutants such as, for instance, toxic substances released into soil, water and atmosphere. To concentrate solely on CO2 reduction hardly qualifies for "optimization" and "responsibility". **The exhortation "We must act now" is cheap unless accompanied with responsible proposals and priorities for action.** And this is what Copenhagen should be about! Your exhortation implies that the participants would not know this unless reminded by your outcry.

Sincerely yours,

Vit Klemes

DK's last—unanswered—email to Vít

On 08/05/2010 21:52, Demetris Koutsoyiannis wrote:

Dear Vit,

I have just returned from EGU, where, among other things, I gave a two-hour lecture to young students. I had notified you that I would "use" you [as a model for young scientists] and I did. I have uploaded my slides on my web site in http://www.itia.ntua.gr/en/docinfo/975/. Please take a look at them and see if there is something that annoys you so as to "rectify" the slides—even at this very late stage. Unfortunately I was able to complete my presentation only one hour before the lecture and I did not have the time to ask your approval of the content referring to you at an earlier stage.

Cordially,

Demetris

Additional skills: Knows about—and enjoys—wine

15 -Wine tasting in Valtice, 2005

As I occasionally have an opportunity to taste the local wines, I can testify that President Havel had made a good choice in this case (I in particular can recommend the region's whites: Traminer, Veltliner, Neuburger, Müller-Thurgau, Riesling).

Copy of slide 15 of Klemeš (2007a) reproduced from slide 46 of Koutsoyiannis (2010) [i.e. DK's lecture for young scientists in which he "used" Klemeš as a model for young scientists].

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