



# ALADIN

*Piet Termonia*





AL  
AT  
NET



**Seminar on High Resolution Modelling  
Radostovice, 15-26 May 2000**







MINISTÈRE DE L'ÉQUIPEMENT, DU  
LOGEMENT,  
DES TRANSPORTS ET DE LA MER

COPIE

DIRECTION DE LA MÉTÉOROLOGIE  
NATIONALE

Boulogne, le

27 NOV. 1990

ETABLISSEMENT D'ETUDES ET DE RECHERCHES METEOROLOGIQUES	
908542	27 NOV. 90
ARRIVEE	

Affaire suivie par : J.P. Geleyn et

D. Lambergeon

Référence à rappeler : MN/RIy 045466

Monsieur le Directeur et cher Collègue,

Par cette lettre, la Direction de la Météorologie Nationale souhaite proposer aux services météorologiques des Pays d'Europe Centrale une collaboration dans le domaine de la Prévision Numérique du temps (P.N.). Cette proposition s'inscrit dans une perspective à moyen terme et vise à valoriser et à accroître l'expertise déjà existante dans votre Service ou votre Pays, tout en générant des retombées positives pour nos propres actions. Elle est complémentaire de la distribution RETIM des produits du système français de P.N. EMERAUDE/PERIDOT (bientôt remplacé par le système ARPEGE).

Une telle démarche, si elle reçoit votre aval, pourrait très probablement bénéficier d'un soutien financier français pour la partie frais de séjour des scientifiques concernés, les voyages restant à votre charge.

Nous envisageons, en cas de réponse positive des Pays contactés, de déposer une telle demande de financement en décembre 1990. Nous aimerions donc avoir très rapidement votre opinion sur cette proposition de collaboration et, dans le cas où elle serait favorable, votre avis sur la proposition de plan ainsi qu'une estimation du nombre de personnes que vous envisageriez d'associer à un tel projet (au sens défini ci-dessus à propos de la phase b)) avec, si possible, leurs noms et curriculum-vitae.

Les correspondants DMN pour tous détails supplémentaires concernant cette proposition sont :

- pour les questions d'organisation et de financement :

Bureau des Relations Internationales  
77, rue de Sèvres  
F-92104 Boulogne Billancourt cédex

Tél. : (33) 1 46 04 91 51  
M. D. Lambergeon, poste 2330  
ou Mme A. Rigaud, poste 2333

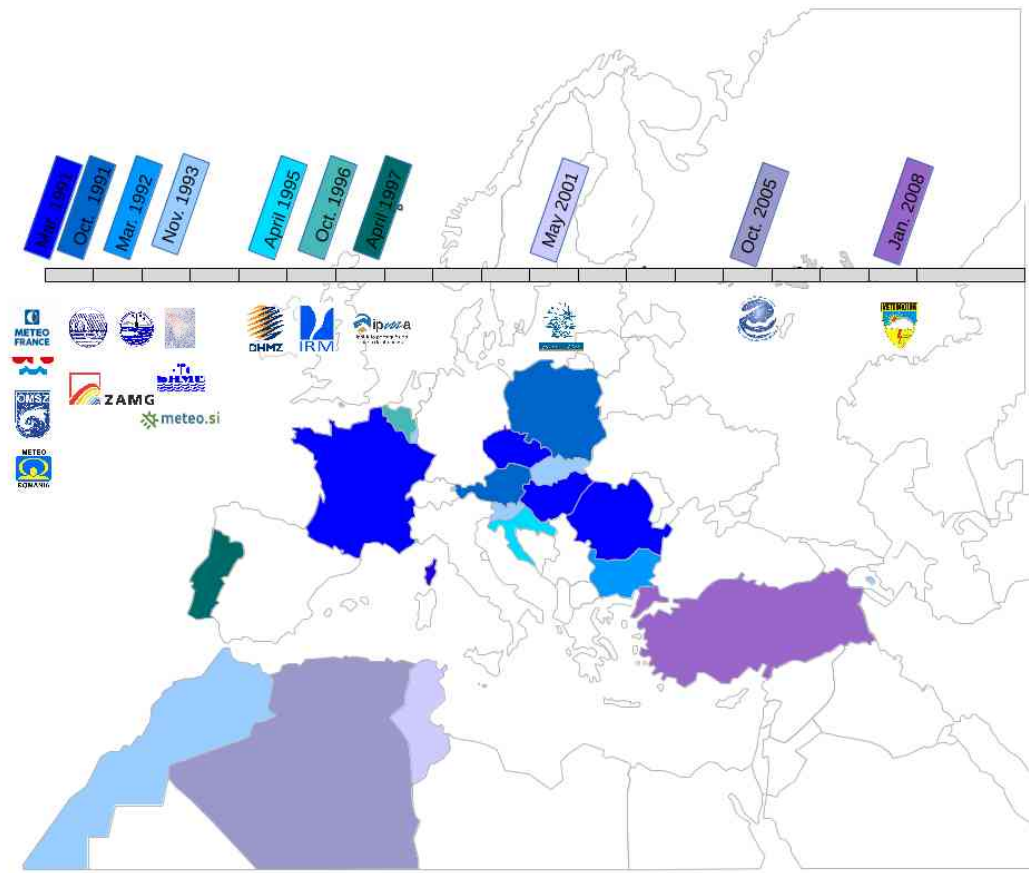
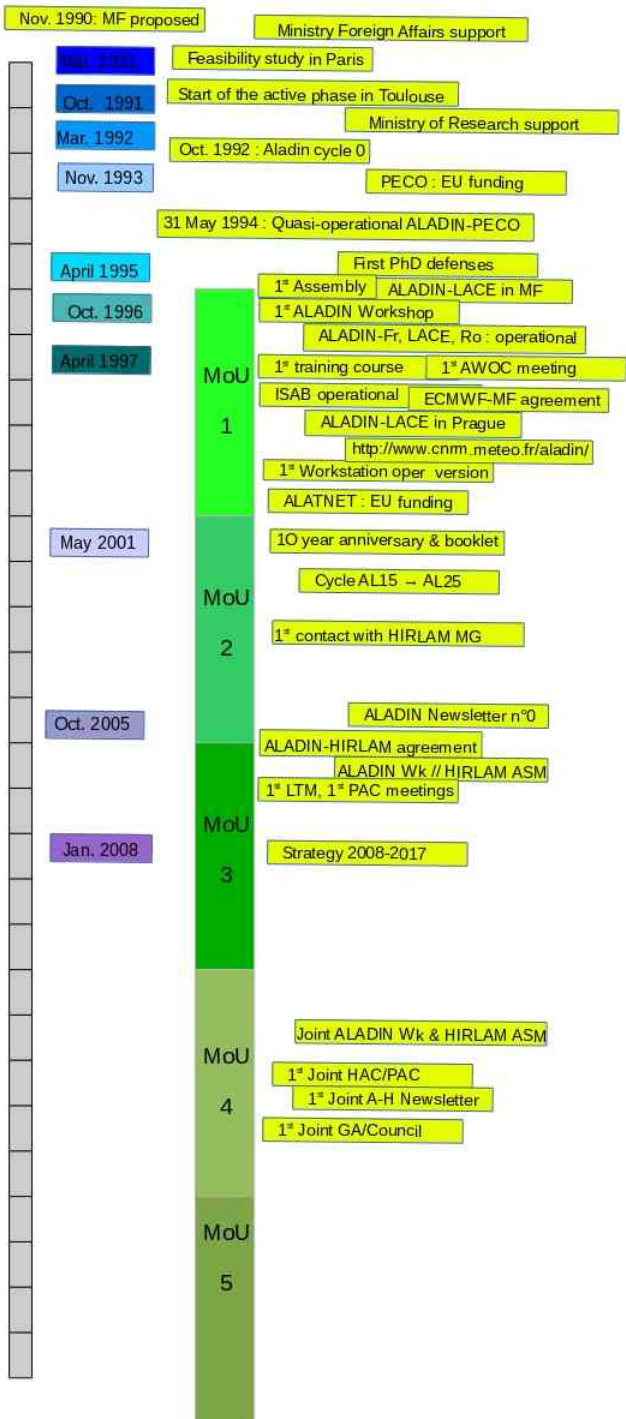
Fax : (33) 1 46054407  
Télex : 633639 F

- pour les questions scientifiques et techniques :

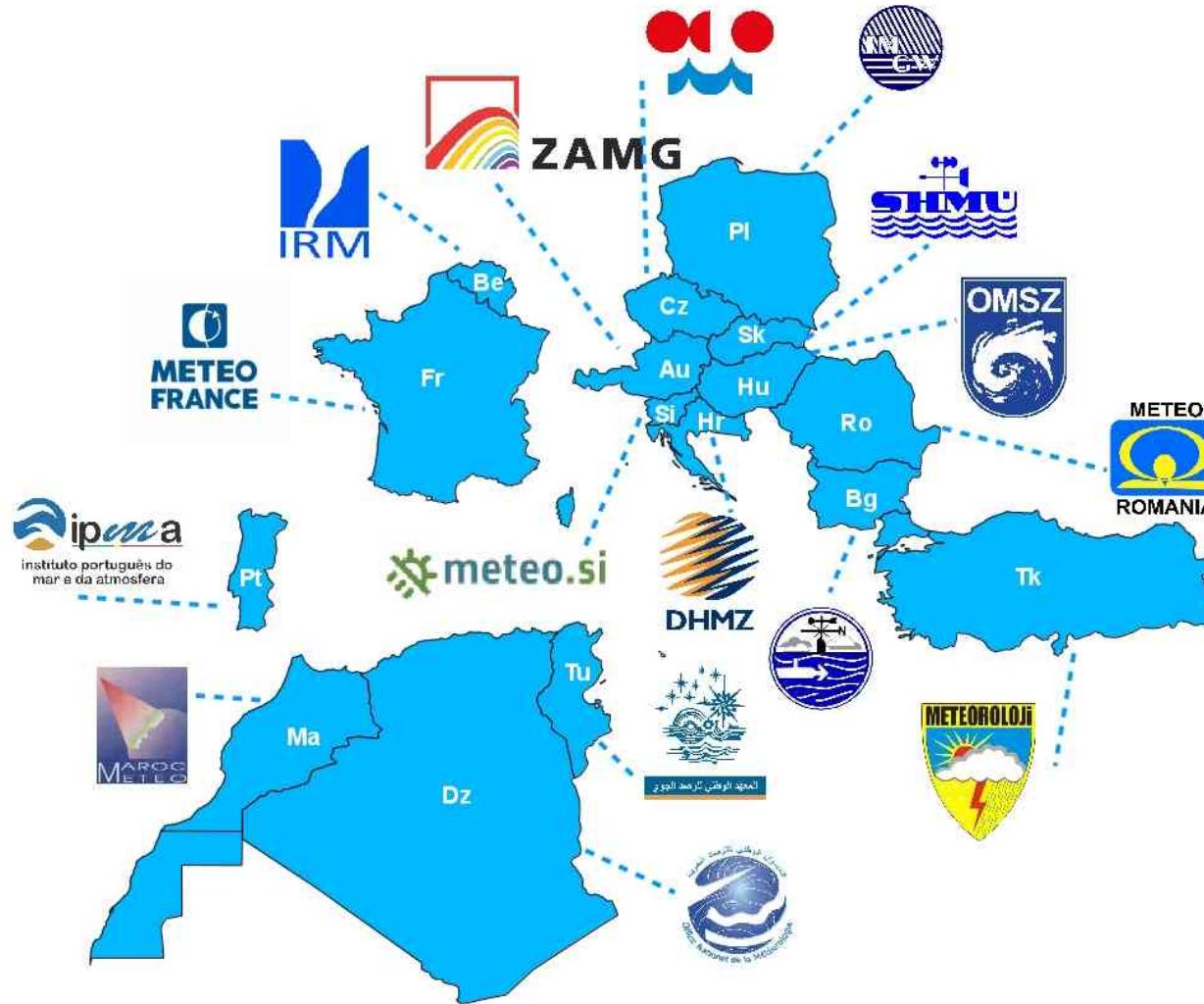
M. J.F. Geleyn  
EERM/CRMD  
2, avenue Rapp  
F-75340 Paris cédex 07

Tél. : (33) 1 45 56 72 75  
Fax. : (33) 1 45 56 72 97

En espérant que nous pourrions développer une collaboration fructueuse dans ce domaine, je vous prie d'agréer, Monsieur le Directeur et cher Collègue, l'expression de ma considération distinguée.

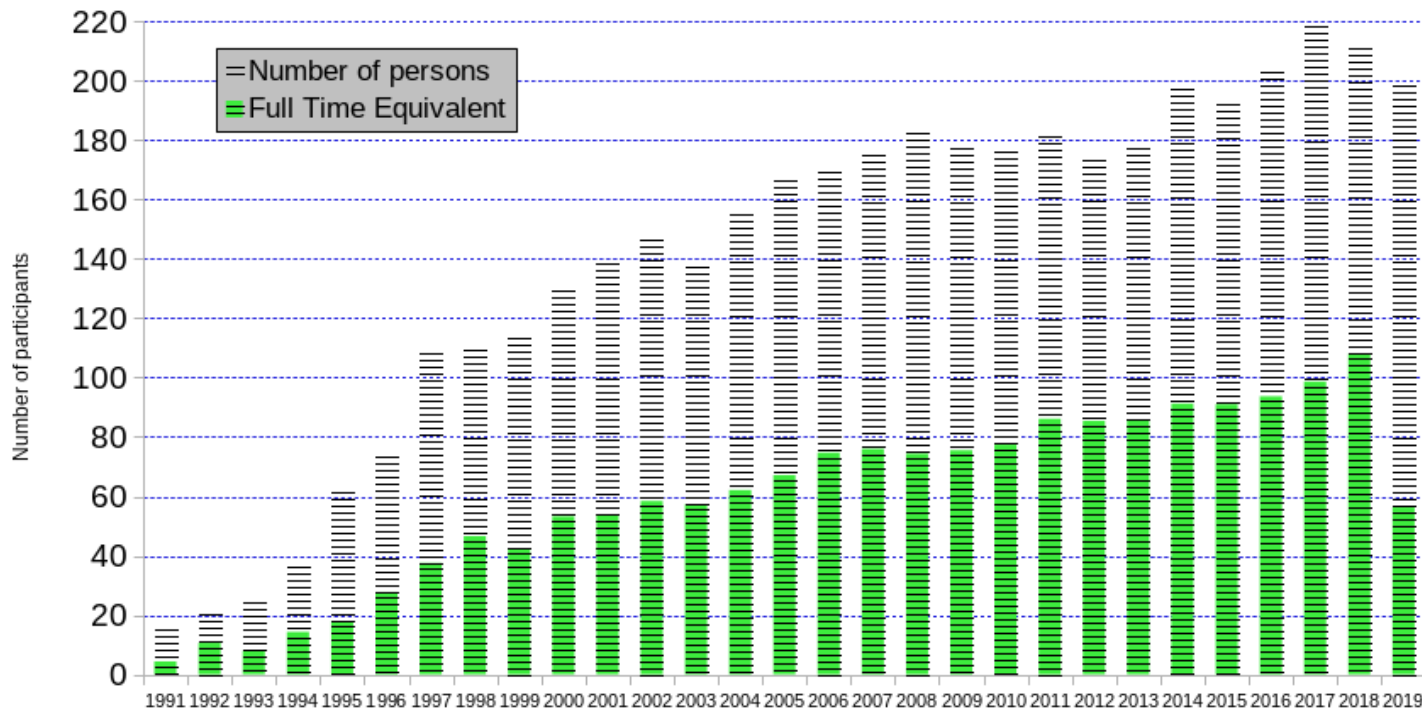


# ALADIN Consortium

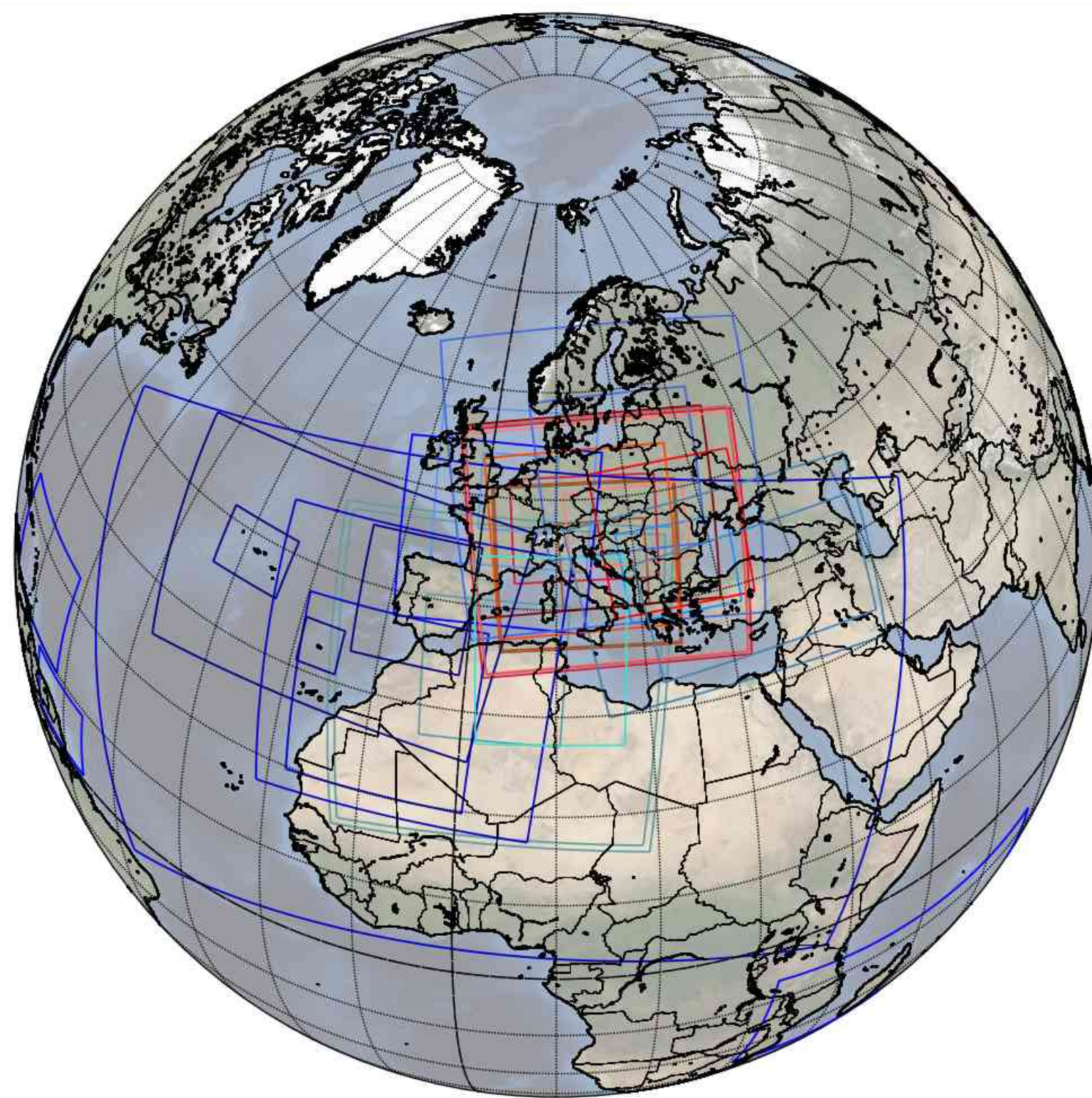


## Total participation in the ALADIN project

Evolution of the yearly Full Time Equivalent (green)







- Algeria: ALGE (aladin)
- Algeria: ALADIN DUST
- Algeria: AROME-NORD-ALGE
- Austria: ALARO5-AUSTRIA
- Austria: AROME-AUSTRIA
- Belgium: Belgium-Alaro-7km
- Belgium: Belgium-alaro-4km
- Bulgaria: aladin-Bulgaria
- Croatia: HR-alaro-88
- Croatia: HR-alaro-44
- Croatia: HR-alaro-22
- Czech Rep: CZ-alaro
- France: Arome-France
- France: AROME-Indian
- France: AROME-Polynesia
- France: AROME-Caledonia
- France: AROME-Guyana
- France: AROME-Antilles
- Hungary: ALARO HU determinis
- Hungary: Arome-HU
- Morocco: aladin-Mo1
- Morocco: aladin-Mo2
- Morocco: AROME Maroc
- Poland: E040-alaro
- Poland: P020-arome
- Portugal: ALADIN-Portugal(ATP)
- Portugal: AROME-Portugal(PT2)
- Portugal: AROME-Madeira(MAD)
- Portugal: AROME-Azores(AZO)
- Romania: ALARO-RO
- Slovakia: Slovakia-alaro
- Slovenia: sis4-alaro
- Tunisia: Tunisia-aladin
- Turkey: Turkey-alaro
- Turkey: Turkey-Arome



# People







## Structure of the Report

- 1) Facts about the Network
- 2) Young Researchers
- 3) Research results
- 4) Research effort
- 5) Networking and Management
- 6) Training (recall of Y2000)
- 7) Proposed new manpower targets
- 8) Conclusion



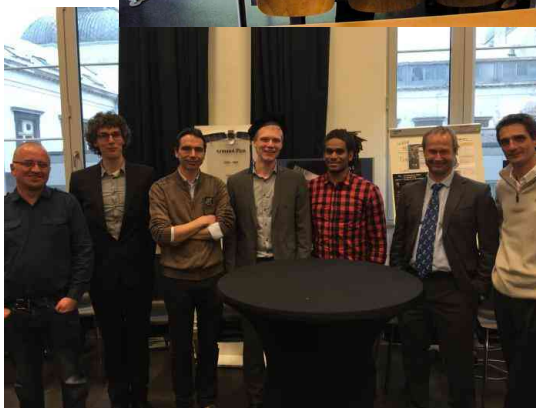
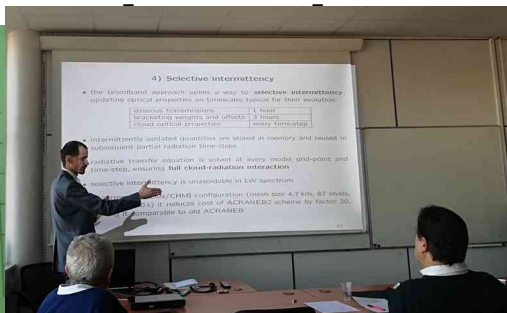
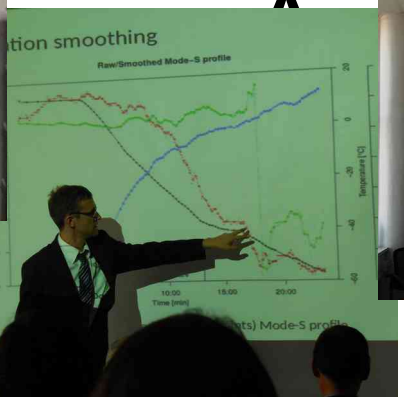
















Recognizing the capabilities and achievements of the NMHS belonging to Aladin and Hirlam consortia:

1. The NMHS present at the joint Aladin-Hirlam meeting (dec 2, 2014) share the same objective to jointly develop and maintain the best possible skilled limited area weather forecasting system, building on the developments of the IFS/Arpege global forecast system and on the Aladin and Hirlam limited area systems. This limited area system is defined as a set of data pre-processing, data assimilation, atmospheric model and postprocessing tools for producing the best possible operational mesoscale weather forecasts.

2. Aladin and Hirlam consortia will work together with the aim of forming one single consortium by the end of the 2016-2020 MoUs. To this aim, the following issues have to be resolved:

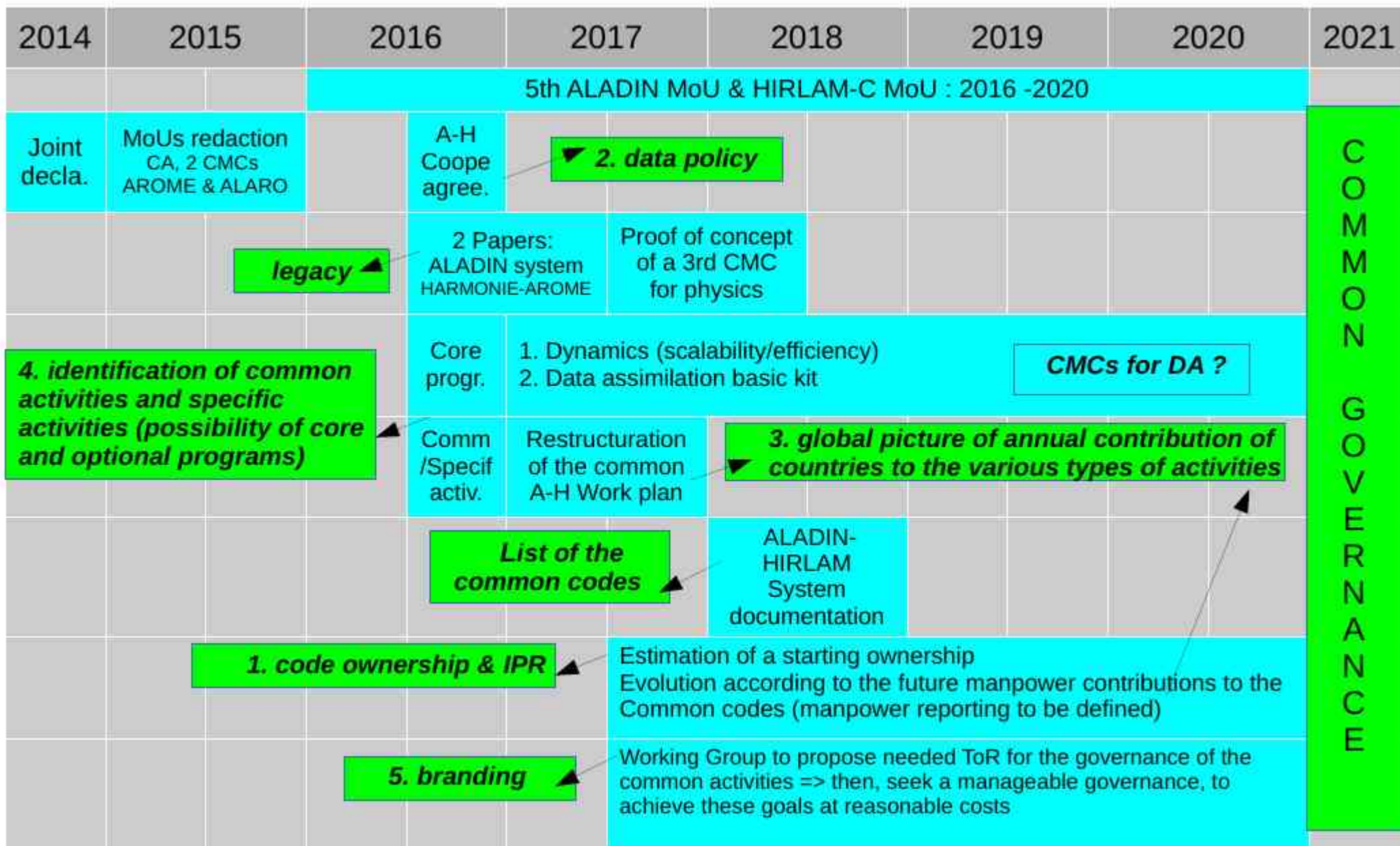
- code ownership (software IPR) : current situation and suitable evolutions. In particular advantages vs drawbacks of open source solutions should be assessed,
- data policy (access to model outputs) ; to this aim a map of the various current operational configurations of the limited area system should be produced and scenarios for data dissemination should be assessed,
- global picture of annual contribution of countries to the various types of activities (from fundamental research to code implementation),
- identification of common activities and specific activities (possibility of core and optional programs),
- branding (including suitable evolution of the name of the system).

3. Human resources to support the work will be identified.

4. Both PM will report every six months on those issues to the consortia governing bodies.

5. Joint meeting of governing bodies of both consortia will be held at least once a year.





**COMMON GOVERNANCE**



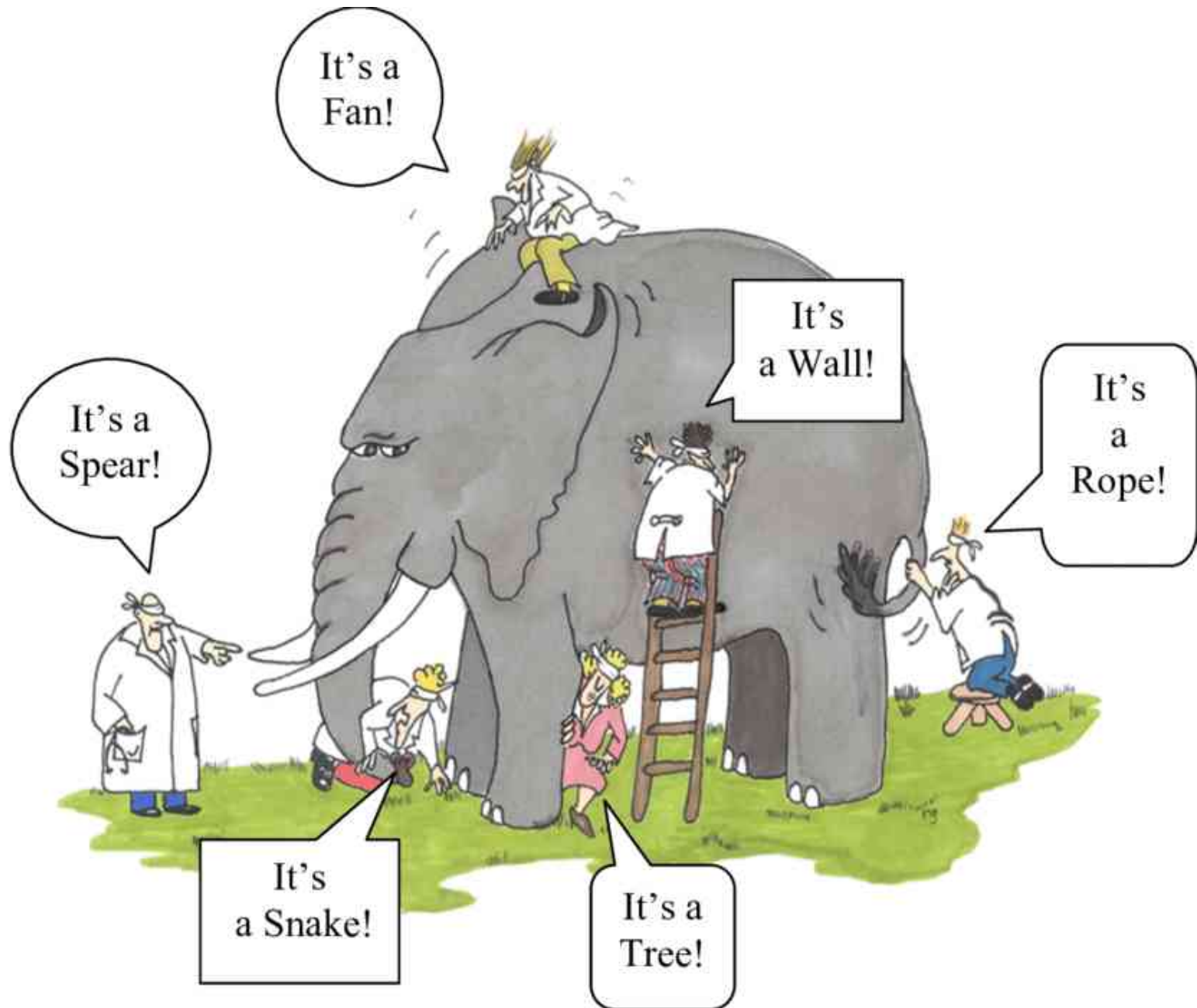
The first principle is that you must not fool yourself –  
and you are the easiest person to fool.

And after you've not fooled yourself,  
it's easy not to fool other scientists

# The Brac-HR workshop (BRain-storming on Advanced Concepts for High Resolution modelling), Brač in Croatia, 17-20/5/2010.

- The item concerning the future of the dynamical core is the one where there are the biggest divergences of opinion within HARMONIE (as well within C-SRNWP +ECMWF).
- It is also clear that there is a strong link with the problems of an incomplete validation system (in a partial and unstructured ensemble of results it is easier to find out the sub-set that supports this or that scientific orientation). In short, there is consensus that deep divergences exist and that we may not have all the information available to treat the problem mainly at the scientific level.
- Even beyond that, is not the drain of human resources which would be associated with a radical change of course concerning the dynamical core incompatible with the need to improve the quality of the HARMONIE forecasting systems in the ~5 years to come?”

# Brac-HR 2010: blind men and an elephant



# Blind men and a dynamical core

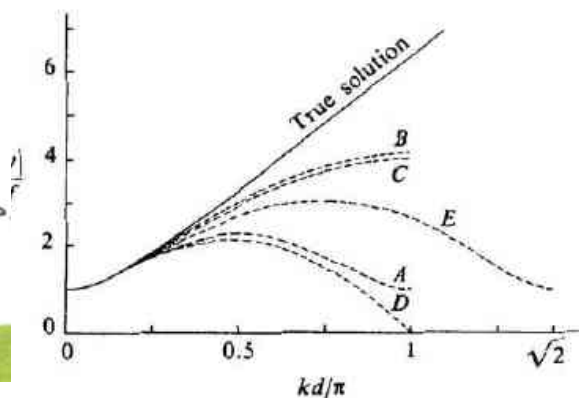
A grid

Spectral discr.

Semi-Lag Adv.

Semi-implicit solver

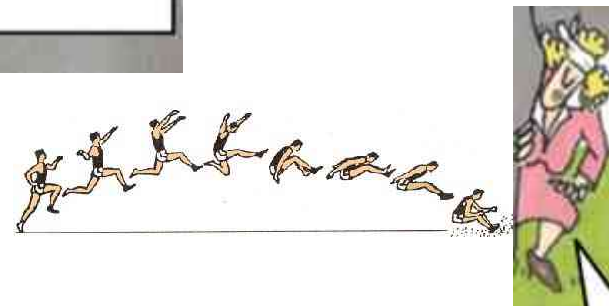
Dispersion relations



$$\frac{\partial \rho}{\partial t} + \nabla \cdot (\rho \mathbf{U}) = 0$$



Conservation!



Step slopes!

Long time steps!

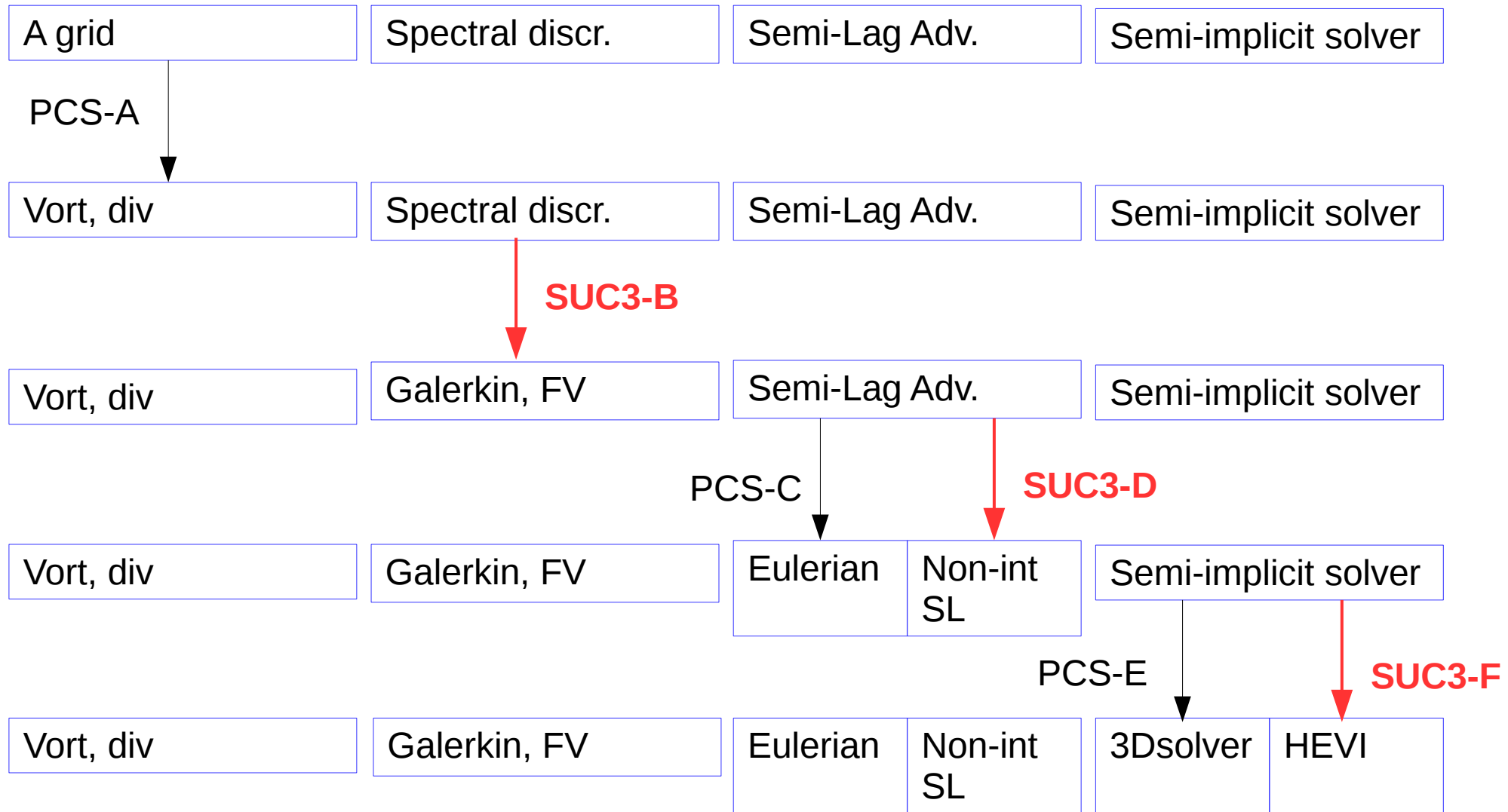


Scalability!



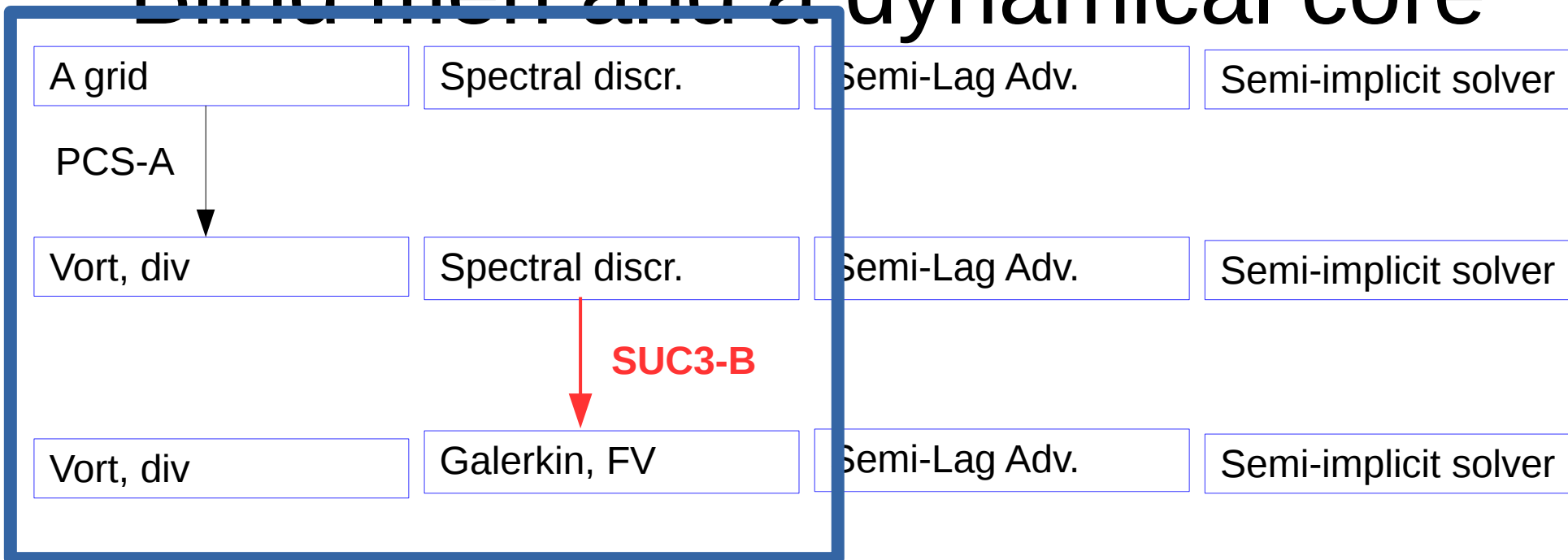


# Blind men and a dynamical core: how to not fool oneself



- Set up clean comparison conditions:
  - **B**: At what scales do we need locality?
  - **D**: How will SL behave at high resolution + fall back solution
  - **F**: Stability (efficiency) of Euler and/or HEVI

# Blind men and a dynamical core



Second-order FD	Spectral
$F(x)$	$F(x)$
$\frac{1}{2\Delta x} [F(x + \Delta x) - F(x - \Delta x)]$	$\frac{dF}{dx}(x)$
$\frac{1}{\Delta x^2} [F(x + \Delta x) - 2F(x) + F(x - \Delta x)]$	$\frac{d^2F}{dx^2}(x)$
1	1
$\frac{1}{\Delta x} i \sin(k\Delta x)$	$ik$
$\frac{2}{\Delta x^2} [\cos(k\Delta x) - 1]$	$-k^2$



## Importance of temporal symmetry in spatial discretization for geostrophic adjustment in semi-implicit Z-grid schemes

Steven Caluwaerts,<sup>a\*</sup> Daan Degrauwe,<sup>b</sup> Piet Termonia,<sup>a,b</sup> Fabrice Voitus,<sup>c</sup>  
 Pierre Bénard<sup>c</sup> and Jean-François Geleyn<sup>a,c</sup>

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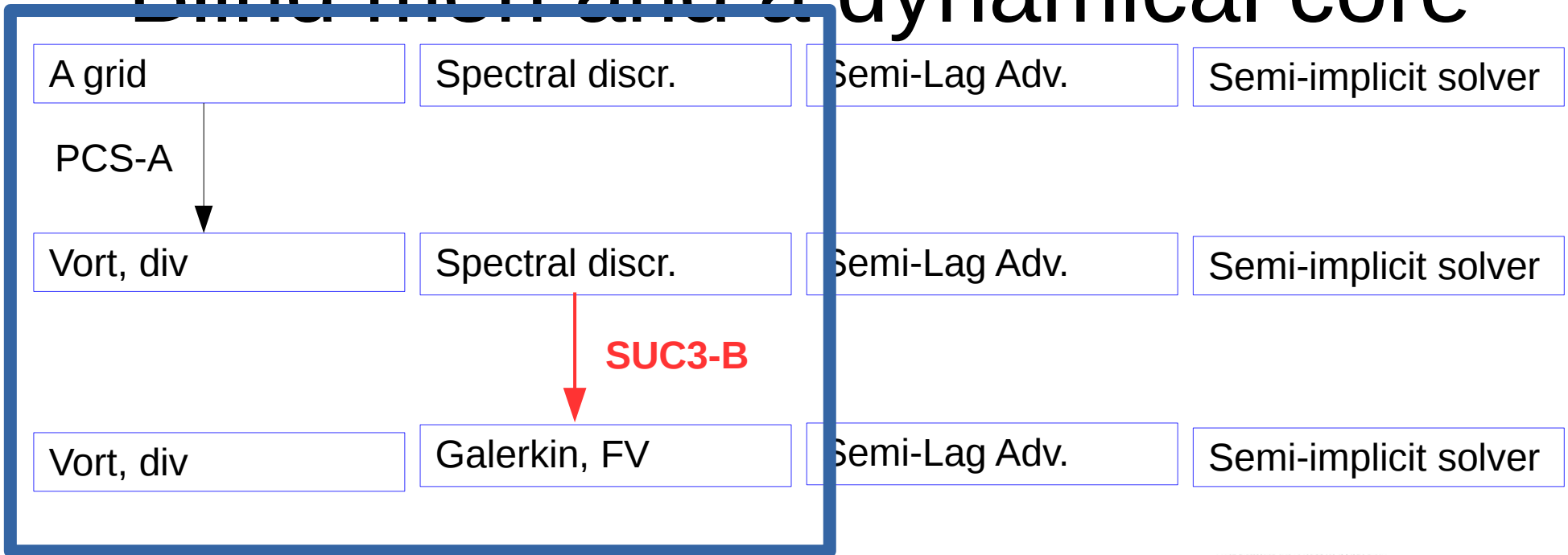
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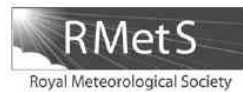


# Blind men and a dynamical core



Quarterly Journal of the Royal Meteorological Society

Q. J. R. Meteorol. Soc. 141: 128–138, January 2015 A DOI:10.1002/qj.2344



## Importance of temporal symmetry in spatial discretization for geostrophic adjustment in semi-implicit Z-grid schemes

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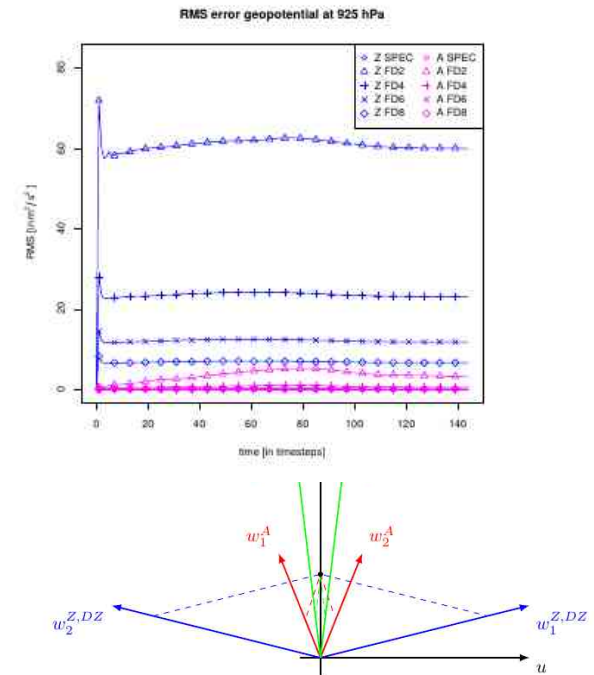
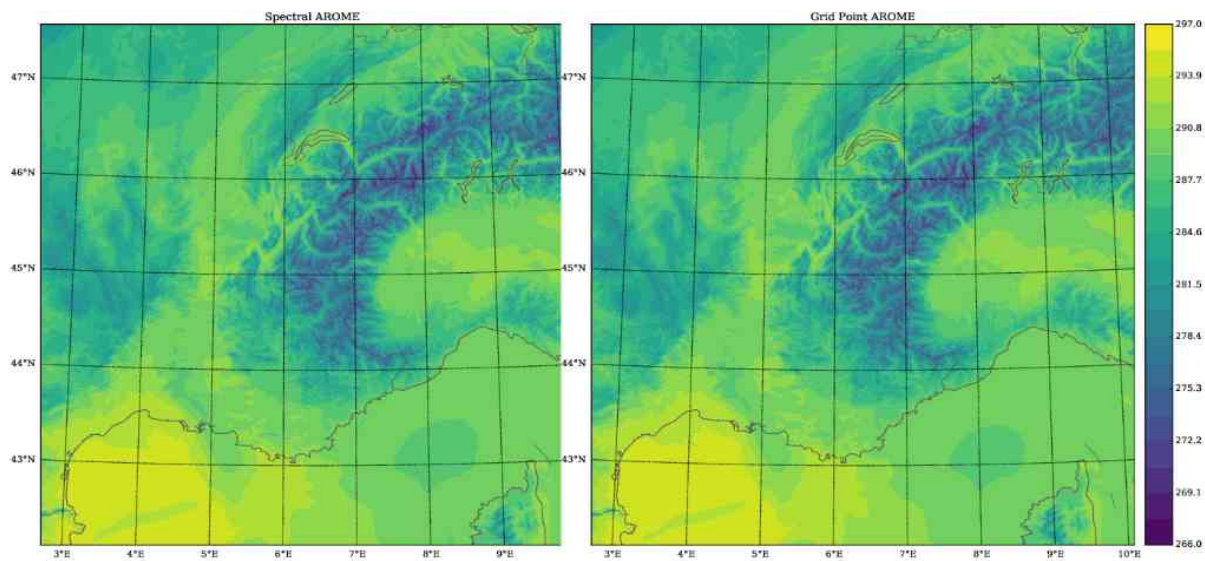
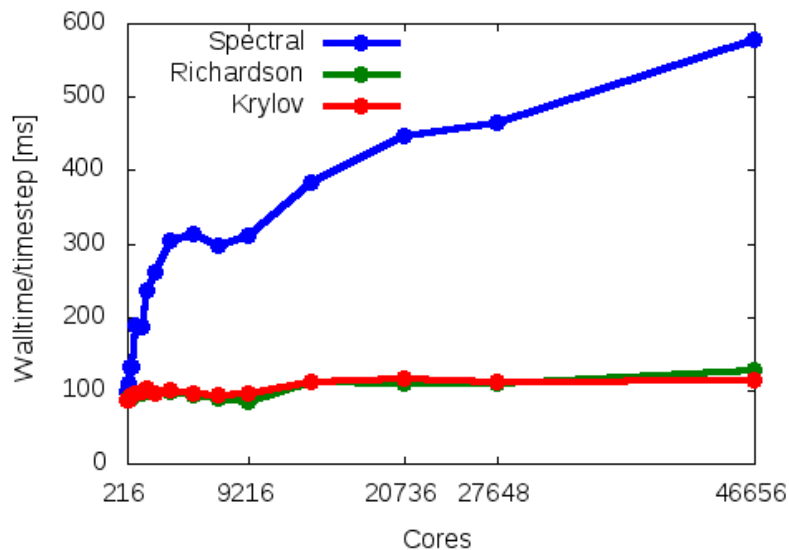
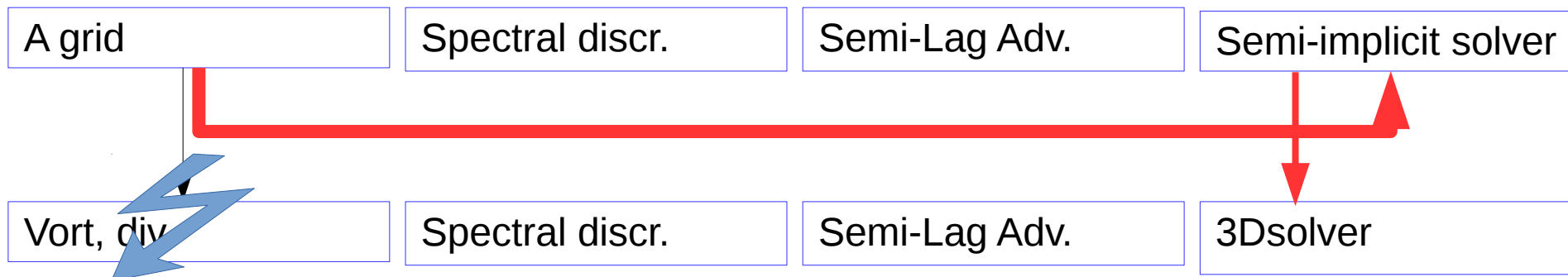


Figure 4.7: Projection of a short wave component of an initial state in rest (black dot on the  $y$ -axis) onto the two eigenvectors. The decoupling is different for the A-grid scheme (red), the DZ-based Z-grid scheme (blue), and the PO-based Z-grid scheme (green).

# Blind men and a dynamical core: how to not fool oneself



$T80$ ,  $\delta t = 50 s$ ,  $T = 2 h$ ,  $\Delta x = 1.3 km$ ,  $N_{iter} \approx 13$ ,  $8^{th}$  order

Non-spectral Helmholtz solver for  
ALADIN-HIRLAM dynamics



Si tu veux construire un bateau, ne rassemble pas tes hommes et femmes pour leur donner des ordres, pour expliquer chaque détail, pour leur dire où trouver chaque chose... Si tu veux construire un bateau, fais naître dans le cœur de tes hommes et femmes le désir de la mer.

Antoine de Saint-Exupéry