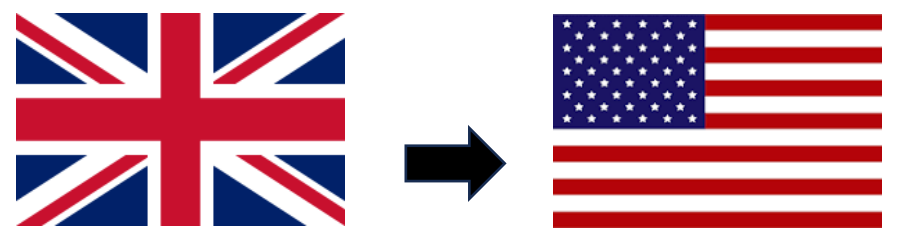




Mike Lynch † 1965 – 2024



- \$40 million
- Unsinkable!
- Tempestade Improvável!
- Fraud \$11bn (Not guilty!)



Autonomy Corporation





Cálculo Bayesiano

Beta μ Post:

Post: O Banhado,
São José dos Campos

Mind the Prior

The "Posterior"

The "Likelihood"

The "Prior"

The "Marginal"

$$P(H|E) = \frac{P(E|H)P(H)}{P(E)}$$

$$P(A|B) = \frac{P(A) P(B|A)}{P(B)}$$

the theory that would not die

how bayes' rule cracked the enigma code, hunted down russian submarines & emerged triumphant from two centuries of controversy

sharon bertsch mcgrayne

"If you're not thinking like a Bayesian, perhaps you should be."
—John Allen Paulos, New York Times Book Review

A|B|C

ABCD

D

A

A&B

B

A|B

AB|C

C

Beta μ Post: Probabilidade inversa

Na probabilidade inversa, o sucesso depende das frustrações; ... ou melhor, da capacidade de se aprender com próprios erros ao longo do processo.

Por exemplo:

- Como estimar a posição da bola branca com os olhos vendados (7), apenas se informadas as posições relativas, a cada nova iteração ou jogada?

$$P(H|E) = \frac{P(H)P(E|H)}{P(H)P(E|H) + P(\neg H)P(E|\neg H)} = \frac{P(H)P(E|H)}{P(E)}$$

YES WE CAN

- Imagine o mesmo raciocínio MODFLOW, aplicado em milhares de células, em três dimensões!

- Isto é inteligência artificial (AI).

Beta μ PEST

www.betami.com.br

Probabilidades, a cada rejeição da posição anterior

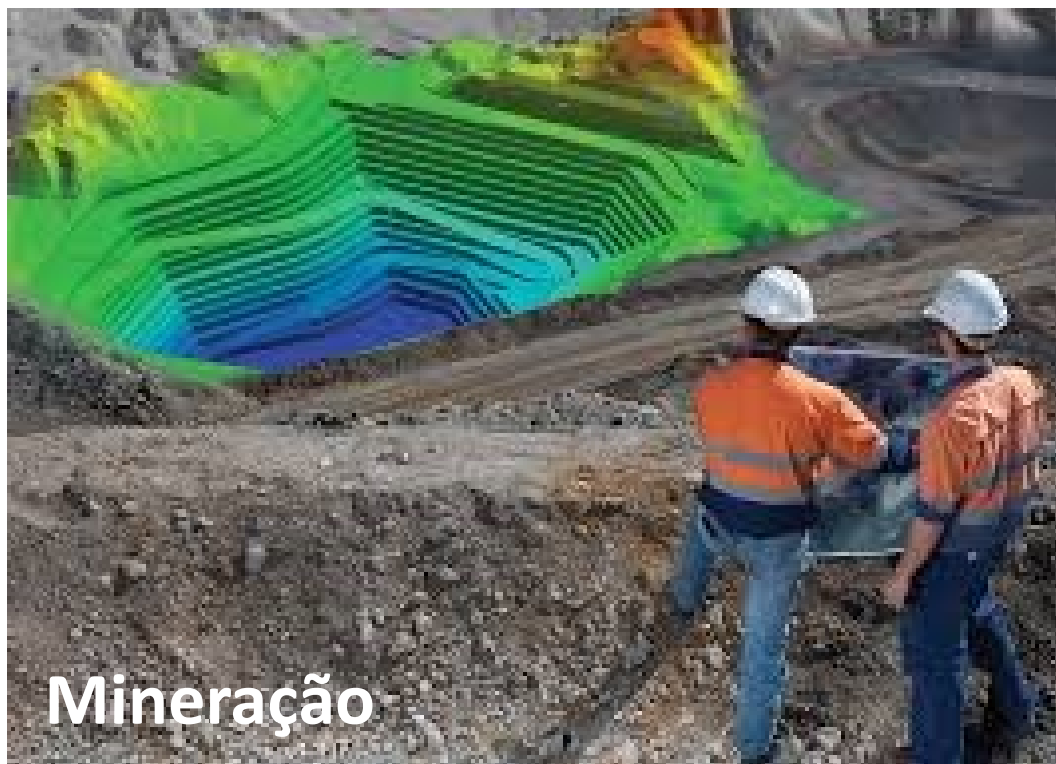
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50

Probabilidades condicionadas

Hipóteses P(H)

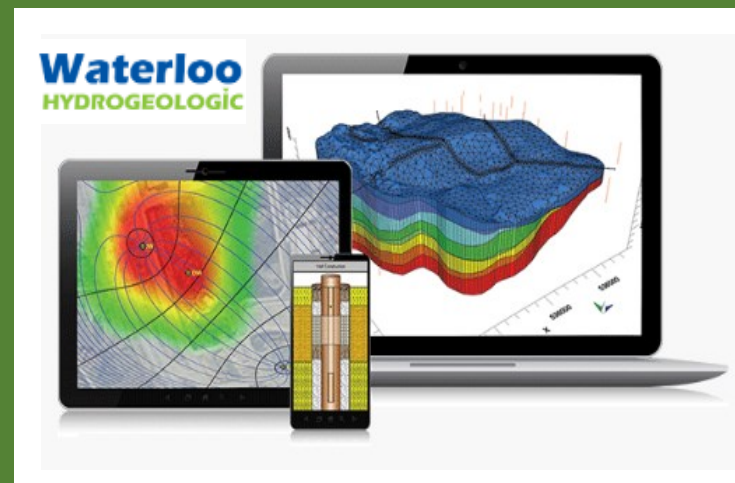
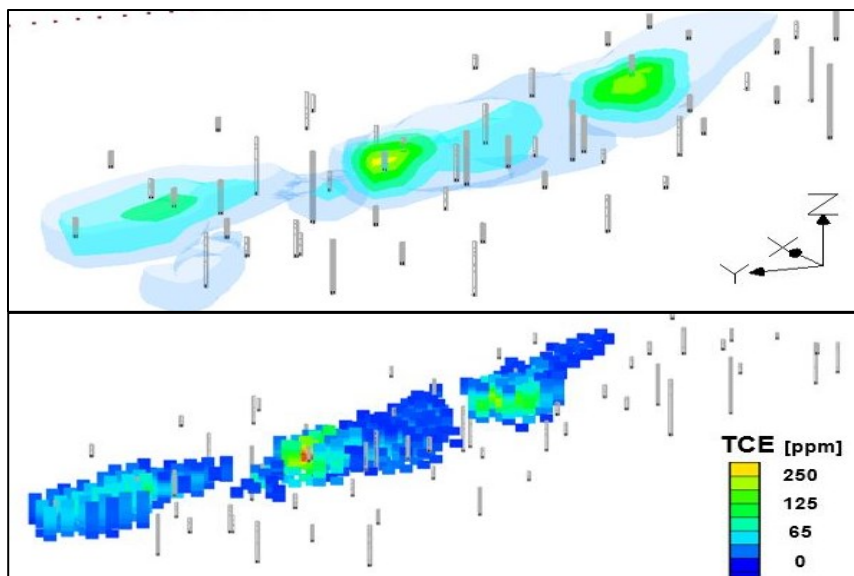
Evidências P(E|H)

Ficando a eficiência a cargo do grau de precisão desejado, do fechamento da malha, tempo e capacidade de processamento



Mineração

≠
GAC



MODFLOW



HYDROALGORITHMICS

HydroAlgorithmic Pty Ltd

Beta μ

<https://www.algocompute.com/>

ITASCA
Denver, Inc.

ITASCA Denver Inc.

<https://www.itasca-denver.com/>

MIKE
Powered by DHI

<https://www.mikepoweredbydhi.com/products/feflow>

DHI

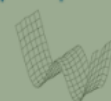
FEflow

esi Environmental
Simulations
Incorporated
www.groundwatermodels.com
Environmental Simulations Inc.

<https://www.groundwatermodels.com/dels.com/>

$\Sigma^2\Pi$ PEST::cloud

S.S. Papadopoulos & Associates, Inc.

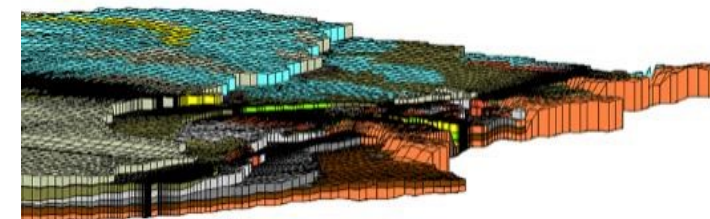


<https://pest.cloud/>

Watermark Numerical Computing

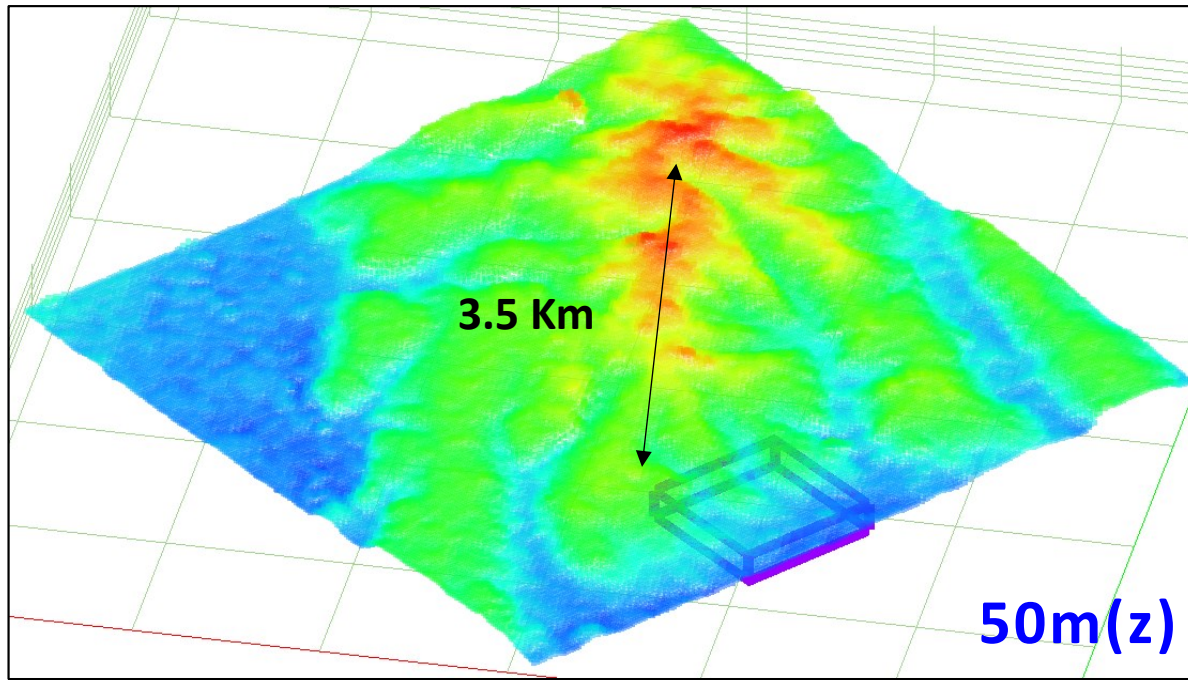
AQUAVEO

GMS



MERCADOS

Beta μ



MODFLOW

Fluxo

x

Transporte

MT3D

PH3D

SEAWAT

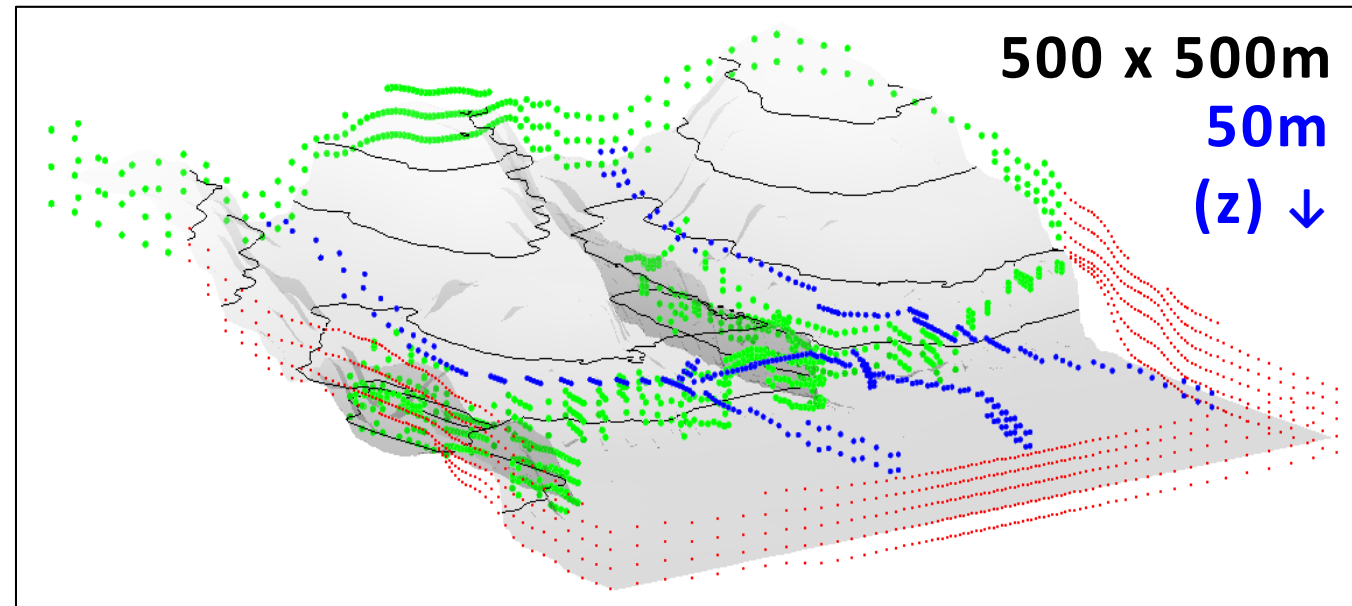
PHREEQX

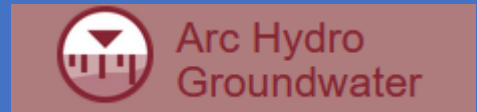
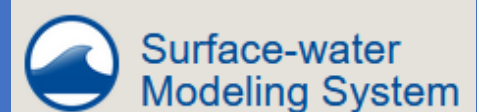
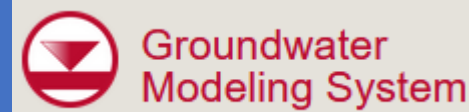
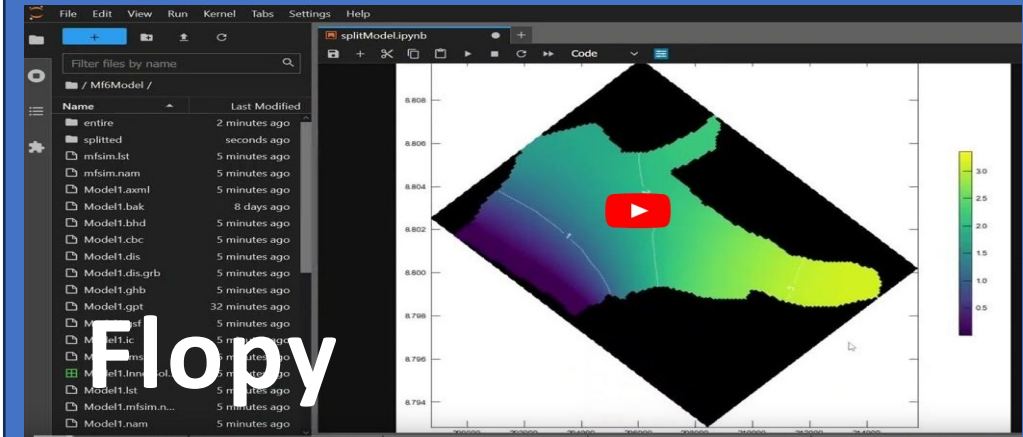
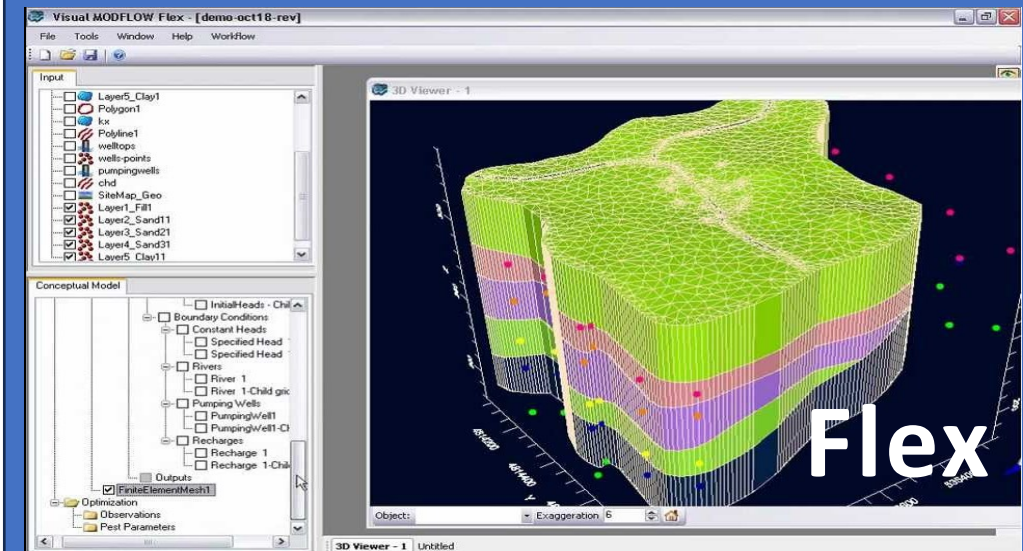
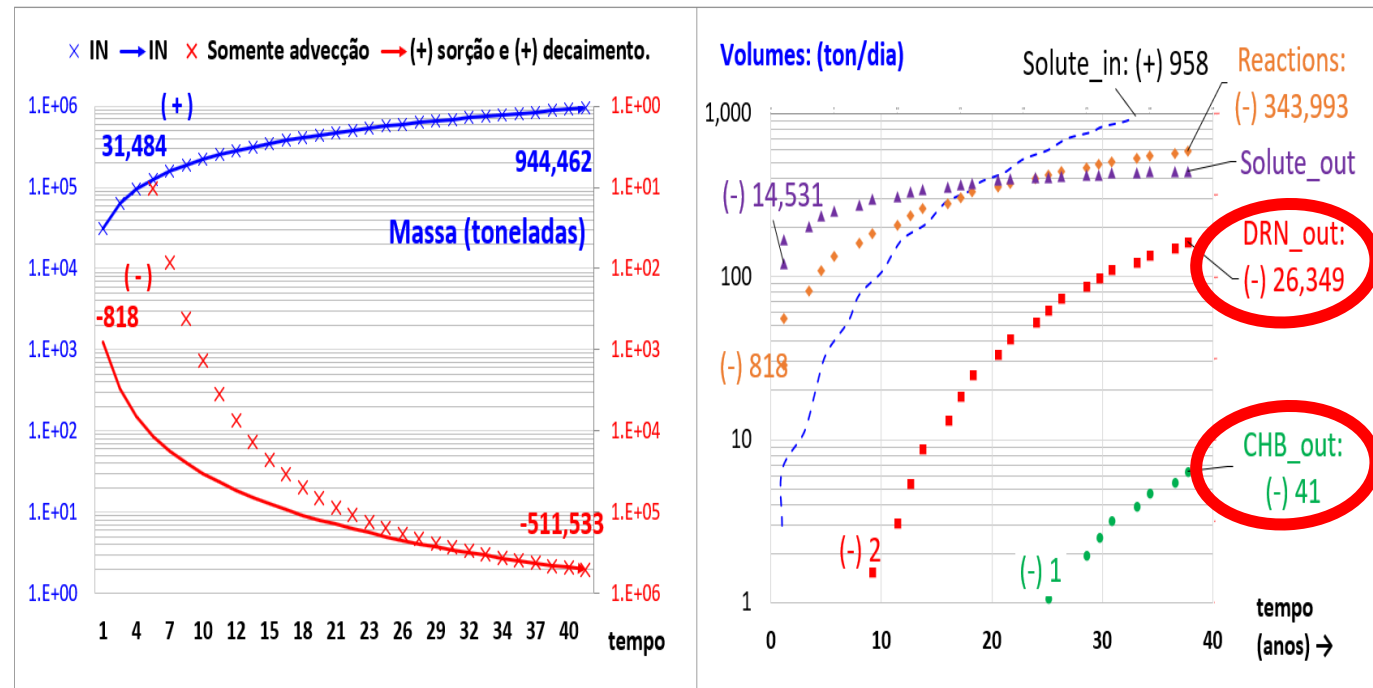
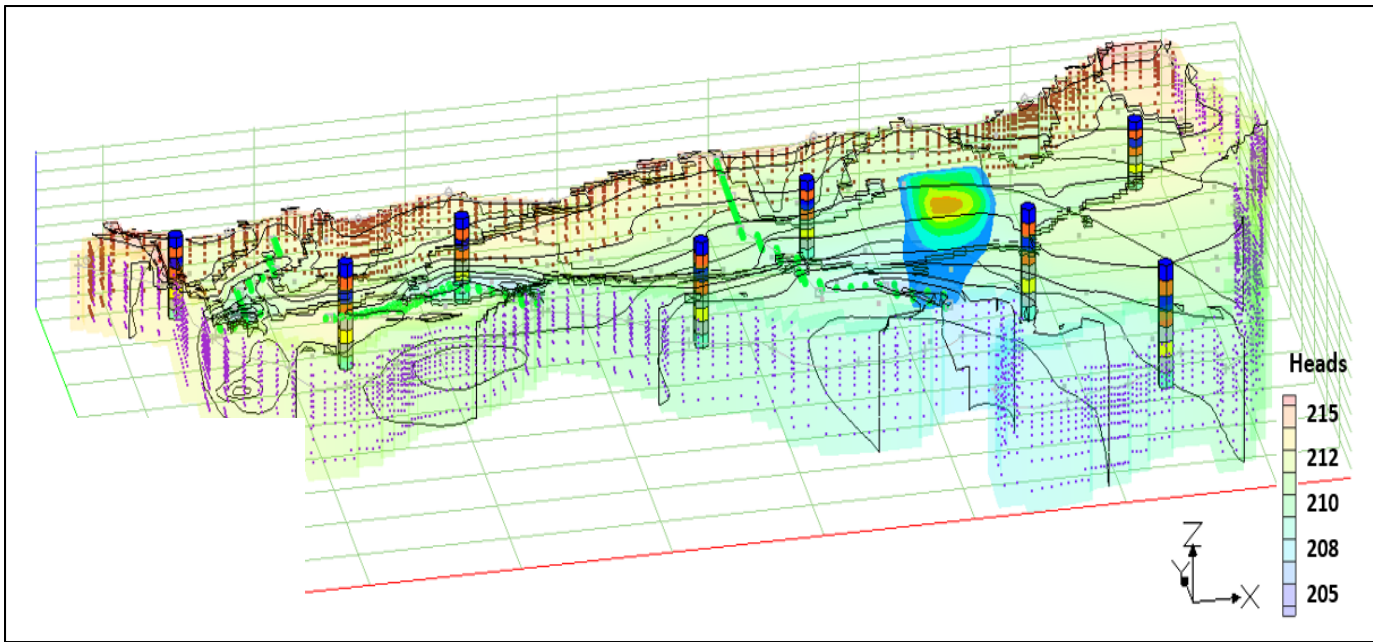
Escala / Dimensões \neq

- Bacia Hidrográfica (1)
- Caixa de fósforos (2)

Vazões

- De condições de contorno!





Planilha Beta μ

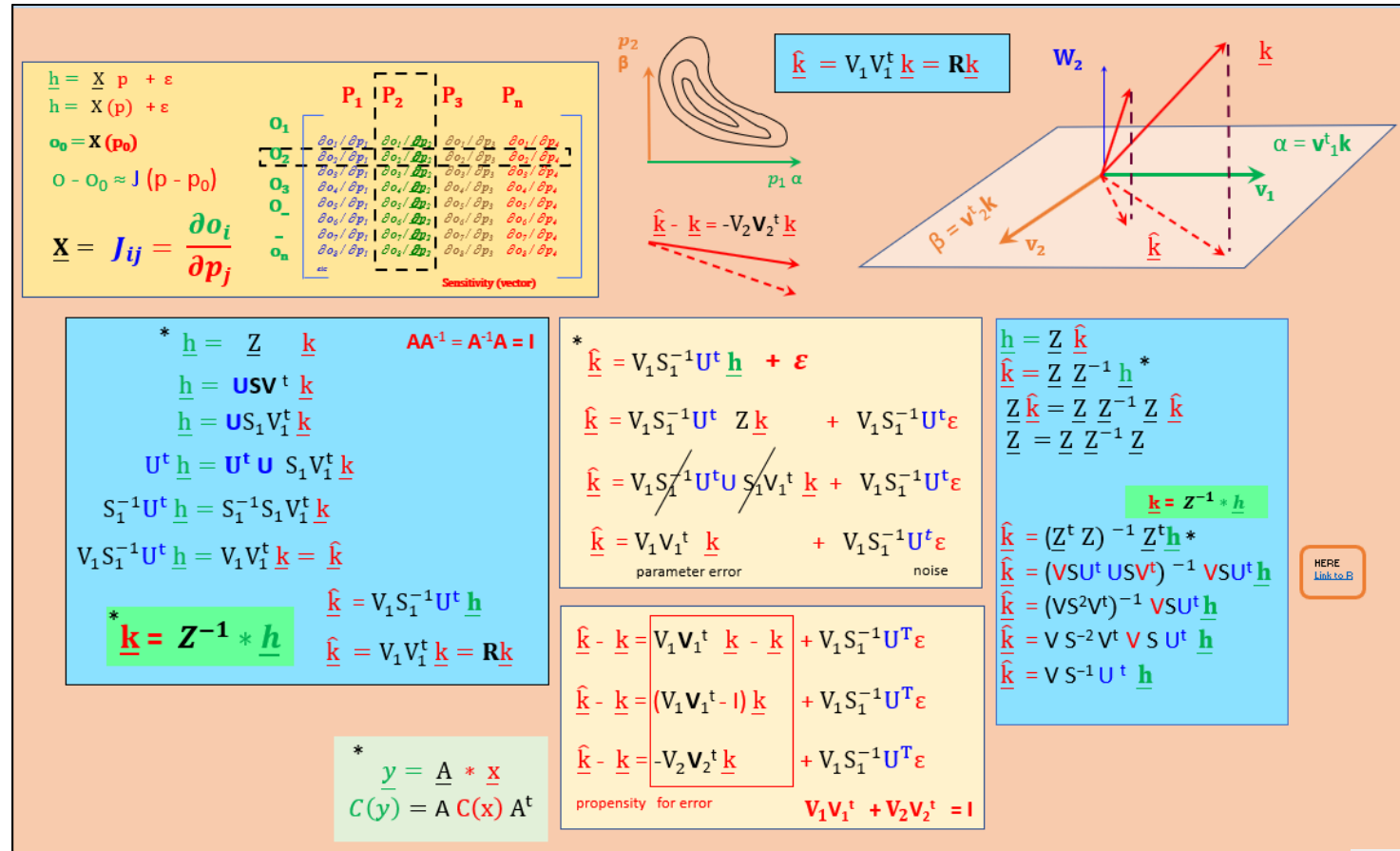
Função Objetivo Φ

Figure 1: A screenshot of a complex spreadsheet interface for a water distribution network model. The interface is divided into several sections:

- Top Section:** A grid of cells containing various parameters and status indicators. Key parameters include **RES** (Residual), **Off_Balance**, **STD** (Standard Deviation), **Beta**, **SEO** (Sensitivity Error), and **SEN** (Sensitivity). The grid uses color-coding (blue, green, orange, red) to highlight different values and status.
- Middle Section:** A large table with multiple columns and rows. The columns are labeled with various parameters and status indicators, including **a1**, **a2**, **G**, **RES_OBS**, **Qde**, **Position**, **DIF_B**, **SEE**, **MED**, **MOD**, **A**, **B**, **#_just_chart**, **#**, **E**, **Zd_B**, **i.**, **PD**, **F**, **aux1**, **STD**, **WR²**, **WR**, **B_SD**, **RW**, **SD2(n)**, **C_SD**, **IN**, **SEO**, **ISEO**, **SEN**, **Sen_PAR**, **LEG.1**, **LEG.2**, **ii**, and **n.**. The rows contain numerical data and status indicators.
- Bottom Section:** A large bar chart titled "MED_Off_Balance" showing the distribution of residuals. The x-axis is labeled **_head**, **_CHD**, **_drain**, and **_ghb**. The y-axis represents the percentage of residuals, ranging from 0 to 100. The chart shows a distribution of residuals across different network components.
- Right Section:** A smaller bar chart titled "Objective function Φ " showing the distribution of the objective function across different network components. The x-axis is labeled **Head**, **Drain**, **GHB**, and **CHD**. The y-axis represents the objective function value, ranging from 0 to 0.5.

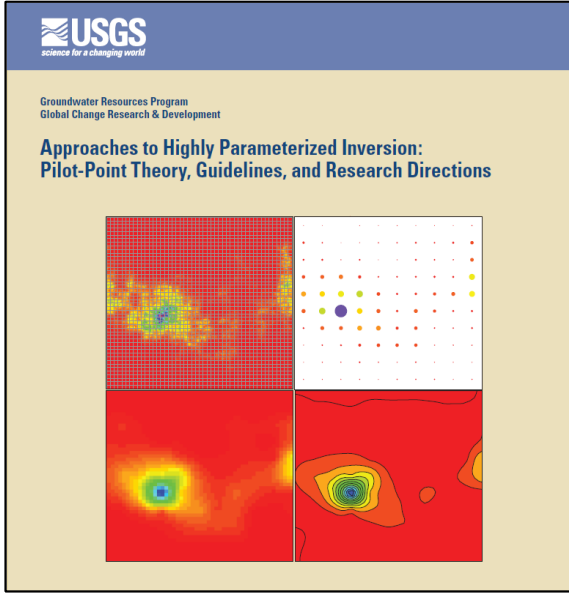
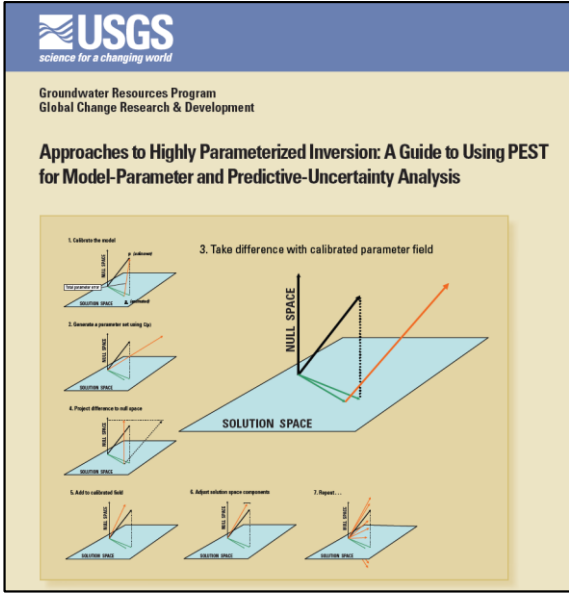
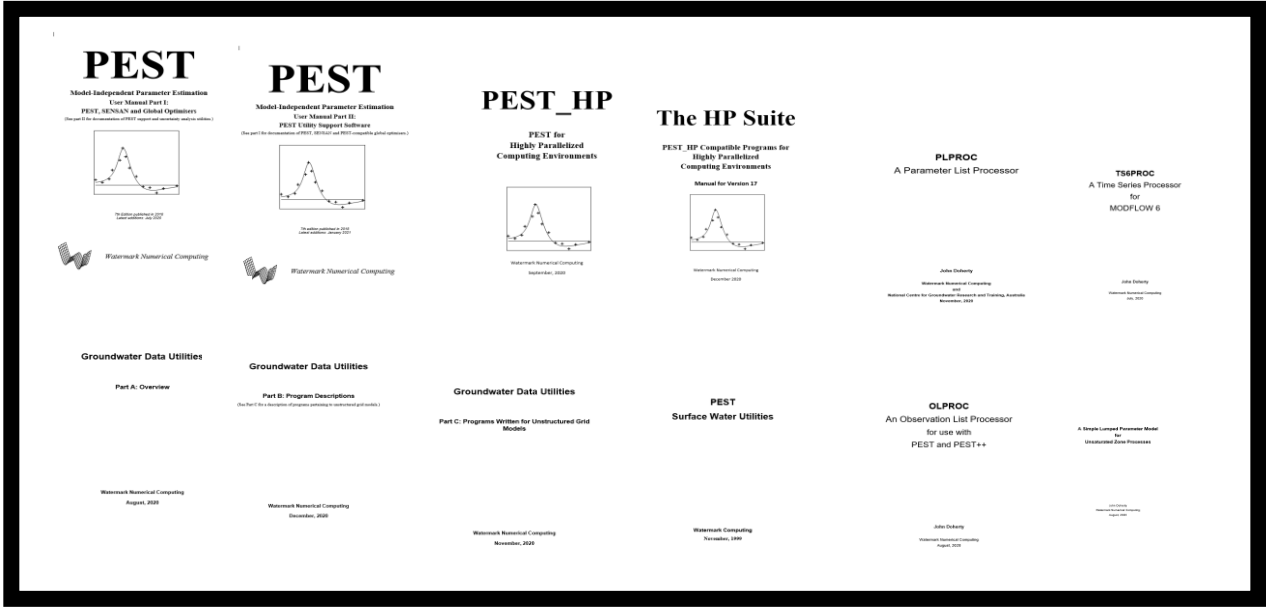


Max # of relative convergence iter (NPHISTP):	3
Relative convergence limit (PHIREDSTP):	0.005
Max # of rel. parameter change iter (NRELPAR):	3
Relative parameter change criterion (RELPARSTP):	0.005
Max relative parameter change per iter (RELPARMAX):	5.0
Max factor parameter change per iter (FACPARMAX):	5.0
<div> <div> Run-time matrix options <input checked="" type="checkbox"/> Covariance matrix (ICOV) <input checked="" type="checkbox"/> Correlation coefficient matrix <input checked="" type="checkbox"/> Eigenvector matrix </div> <div> Regularization options PHIMLIM: 0.001 PHIMACCEPT: 0.0011 FRACPHIM: 0.1 </div> </div>	
<input type="checkbox"/> Automatic user intervention (AUI)	
<input checked="" type="checkbox"/> Specify RLAMBD A1, RLAMFAC, NUMLAM	
Initial Marquardt lambda (RLAMBD A1):	10.0
Marquardt lambda adjustment factor (RLAMFAC):	2.0
Num. lambdas per iteration (NUMLAM):	10



Open source

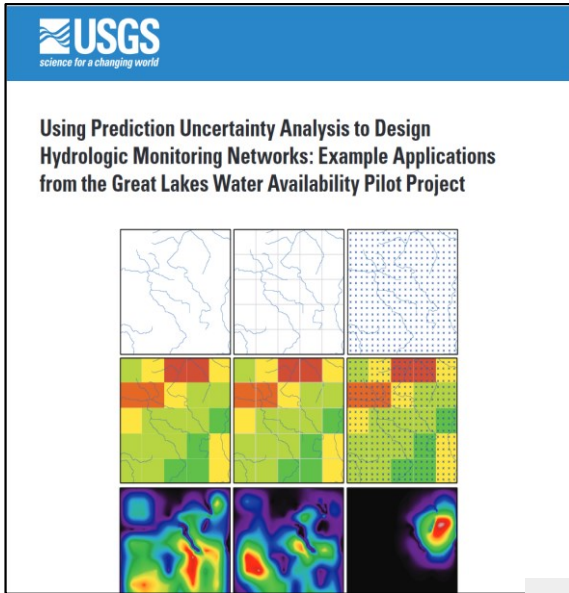
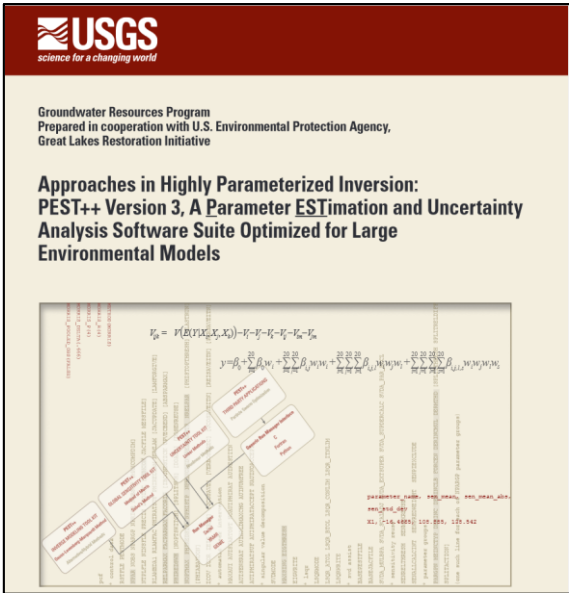
Milhares de páginas de instruções



John Doherty



US Army
Corps of Engineers



Obrigado!

Beta μ