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Comparison of Adjustment Methodologies

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Discussion Points

- **Fundamental theory and Basic equation to adjust differential data and covariances?**

- **Unique features ?**

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Comparison of Adjustment Equations

Organi-zation	Theory	Basic equation	Referenc e	Major unique feature
INL (USA)	Lagrange multiplier's method	$\tilde{y} - y = -(I - B_y A^T G^{-1} A)v$ $B_{\tilde{y}} = (I - B_y A^T G^{-1} A) B_y (I - B_y A^T G^{-1} A)^T$	Gandini, "AMARA", 1973	Limit the number of adjusted parameters. $\left\|\Delta R_{ip}^2\right\| = \left\|S_R^+ DS_R\right\| \geq \varepsilon^2$
JSI (Slovenia)	Partitioned least-square method	ZOTT-99 code	Muir, NSE 101, 1989	Modify input covariances to enforce unit χ^2.
IPPE (Russia)	Maximum likelihood method	$C' - C = WH^T (V + HWH^T)^{-1} (I - I_P)$ $W' = W - WH^T (V + HWH^T)^{-1} HW$	Manturov, "INDECS", 1984	Check of data consistency. $1 \quad STD \quad \geq \left\|\sqrt{\frac{\chi^2}{N}} - 1\right\|$
JAEA (Japan)	Baysian parameter-estimation method	$T' = T_0 + MG^t \left[GMG^t + V_e + V_m\right]^{-1} \left[R_e - R_c(T_0)\right]$ $M' = M - MG^t \left[GMG^t + V_e + V_m\right]^{-1} GM$	Dragt, NSE 62, 1977	Include the Vm explicitly.
NRG (Netherlands)	Total Monte Carlo method	TALYS, NJOY and MCNP codes	Koning, Annals N.E. 35, 2008	Alternative approach to propagate uncertainties.
CEA (France)	Bayes' theorem method	$\vec{\sigma} - \vec{\sigma}_m = M_\sigma \cdot S^T (M_E + S \cdot M_\sigma \cdot S^T)^{-1} \cdot \left(\vec{E} - \vec{C}(\sigma_m)\right)$ $M_{\sigma'} = M_\sigma - M_\sigma \cdot S^T (M_E + S \cdot M_\sigma \cdot S^T)^{-1} \cdot S \cdot M_\sigma$	Gandini, Symposium, Tokyo, 1973	Applied to ERALIB1.

Concluding Remarks

- **Fundamental theory and Basic equation.**
  - **Four organizations (JSI, IPPE, JAEA and CEA) applies the identical equations,**
  - **The equations of INL seems mathematically identical with above, and,**
  - **The total Monte Carlo method by NRG is an alternative way to propagate uncertainties, so the essential results are expected equivalent with others.**

- **Unique features among them.**
  - **INL seems to like limiting the number of adjusted parameters, but what is the motivation?,**
  - **JSI modifies the input covariances to enforce unit χ^2 , but the actual procedure such as the change of diagonal elements is persuasive?**
  - **IPPE checks the data consistency with the range of $\left|\sqrt{\frac{\chi^2}{N}} - 1\right|$, but what is the reason of one STD as criteria?**
  - **JAEA would like to make the consensus on the need of Vm in SG33 activity,**
  - **TMC approach of NRG is quite unique, but the balance of cost and benefit?**
  - **CEA has already opened the adjusted library ERALIB1, but was it accepted in the industry or authority? Are there room for improvement?**