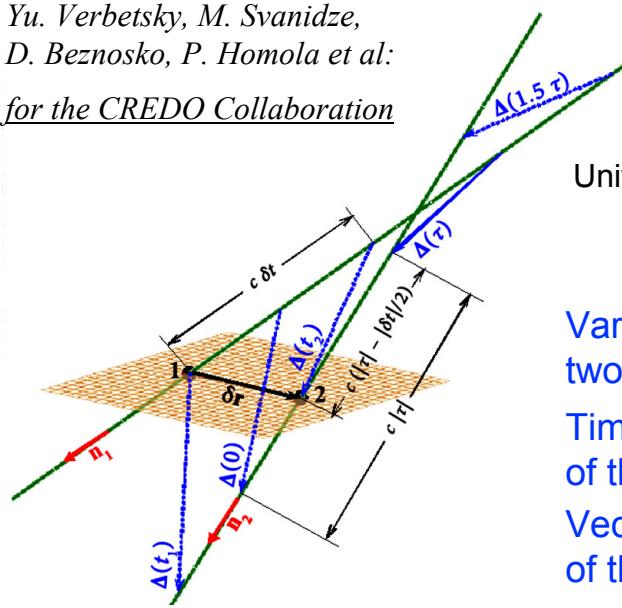


On the possible method of identification of two probably cognate Extensive Air Showers

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Radius-vectors of two showers' cores

observation points

$$\mathbf{r}_{01}, \mathbf{r}_{02}; \quad \delta\mathbf{r} = \mathbf{r}_{02} - \mathbf{r}_{01}$$

$$\mathbf{M}_1, \mathbf{M}_2; \quad \mathbf{M} = \mathbf{M}_1 + \mathbf{M}_2$$

$$\hat{t}_{01}, \hat{t}_{02}; \quad \delta t = \hat{t}_{02} - \hat{t}_{01}$$

$$\sigma_{t1}^2, \sigma_{t2}^2; \quad \sigma_{\delta t}^2 = \sigma_{t1}^2 + \sigma_{t2}^2$$

The times of those showers' observations

with their dispersions

$$\langle \mathbf{n} \rangle = (\mathbf{n}_1 + \mathbf{n}_2)/2$$

Unit vectors of the showers fronts'
motion directions
with their covariance matrices

$$\mathbf{n}_1, \mathbf{n}_2; \quad \delta\mathbf{n} = \mathbf{n}_2 - \mathbf{n}_1;$$

$$\mathbf{D}_1, \mathbf{D}_2; \quad \mathbf{D} = \mathbf{D}_1 + \mathbf{D}_2;$$

$$\mathbf{D}/4$$

Variable vector connecting
two moving showers' ancestors

$$\Delta(t) = \underbrace{[\delta\mathbf{r} - \langle \mathbf{n} \rangle (c \delta t)]}_{\text{const}} + \underbrace{(c \delta\mathbf{n}) \cdot t}_{\text{const}}$$

Time of the closest approach
of the showers' ancestors

$$\tau = -\frac{1}{c} \cdot \frac{(\delta\mathbf{r}^T \delta\mathbf{n})}{(\delta\mathbf{n}^T \delta\mathbf{n})}$$

Vector of the closest approach
of the showers' ancestors

$$\Delta = \Delta(\tau) = \delta\mathbf{r} - (c \delta t) \cdot \langle \mathbf{n} \rangle - \frac{(\delta\mathbf{r}^T \delta\mathbf{n})}{(\delta\mathbf{n}^T \delta\mathbf{n})} \cdot \delta\mathbf{n}$$

Lorentz-invariant verifying parameters:

Time **Sequencing** parameter

$$S = \text{arsinh} \left(c(\tau + |\delta t|/2) / |\delta\mathbf{r}| \right)$$

Showers' historical **Proximity** parameter

$$P = -\ln \left(|\Delta| / (k \cdot \sigma_\Delta) \right)$$

Combined verifying criterion
of possible historical proximity
of both observed showers

$$K = \frac{2}{\pi} \Psi = \frac{2}{\pi} \text{arctg} \left(\frac{S}{P} \right)$$

Unrealizable approach in the future

Unreliable proximity
in the past

Possibly
related showers

