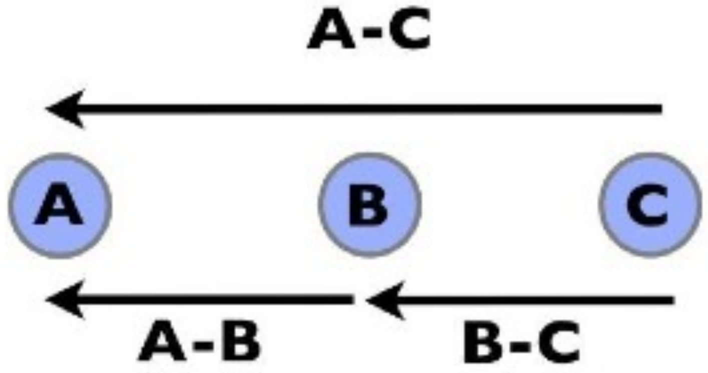
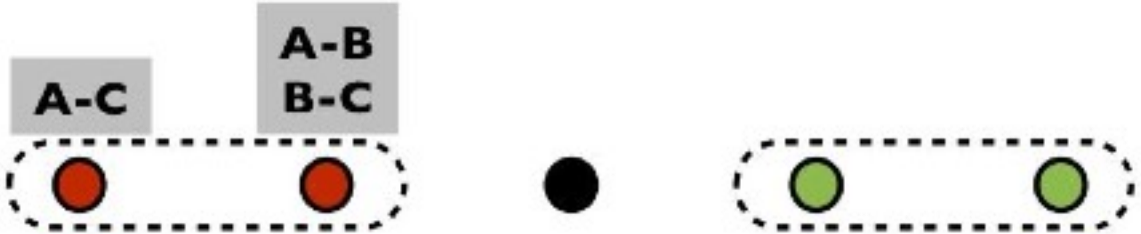
redundant linear array





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[redacted]

Redundant array

For redundant apertures, phase errors add:

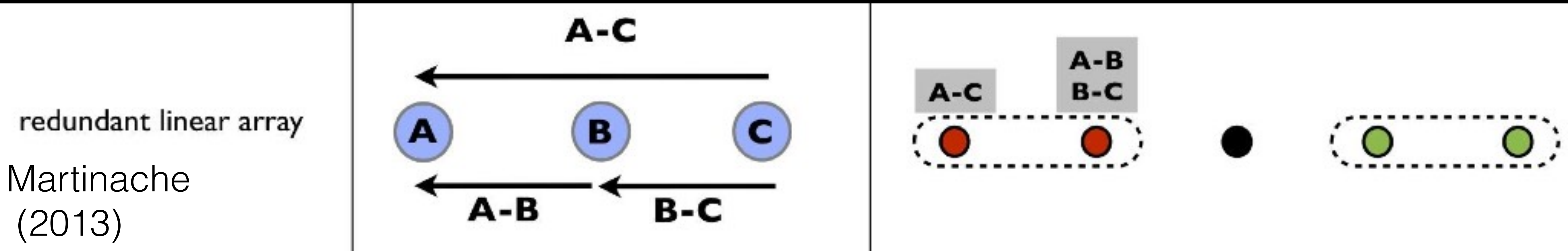
$$\phi = \mathrm{Arg}[\exp i\,(\phi_0 + \varphi^A - \varphi^B) + \exp i\,(\phi_0 + \varphi^B - \varphi^C)]$$

Taylor Expand (assuming phase errors are small)

$$\phi = \phi_0 + \tfrac{1}{2}\,(\varphi^A - \varphi^C) \qquad\qquad \mathbf{\Phi} = \mathbf{\Phi}_0 + \mathbf{R}^{-1} \bullet \mathbf{A} \bullet \boldsymbol{\varphi}$$

Where **R** encodes the redundancy and **A** again encodes the baselines:

$$\mathbf{R}^{-1} = \begin{bmatrix} 1 & 0 \\ 0 & \tfrac{1}{2} \end{bmatrix} \qquad \mathbf{A} = \begin{bmatrix} 1 & 0 & -1 \\ 1 & -1+1 & -1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 0 & -1 \end{bmatrix}$$



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Kernel-phase

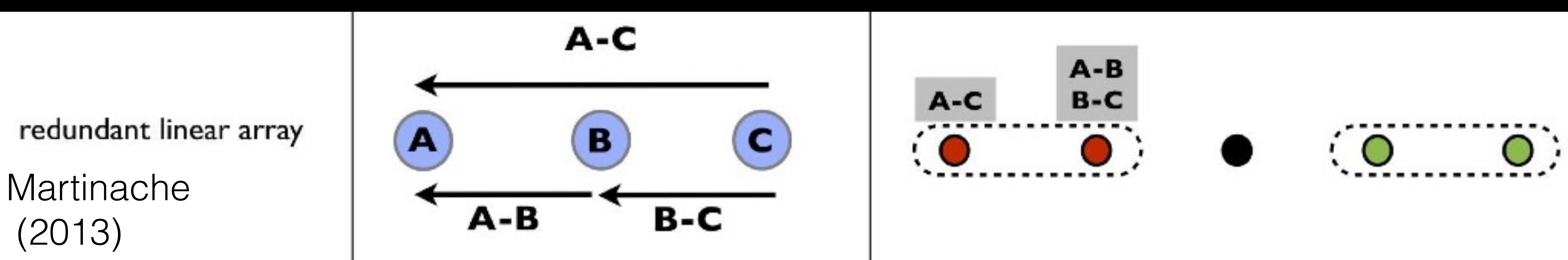
$\Phi = \Phi_0 + \mathbf{R}^{-1} \bullet \mathbf{A} \bullet \varphi$ $\quad$ $\mathbf{R}^{-1} = \begin{bmatrix} 1 & 0 \\ 0 & \frac{1}{2} \end{bmatrix}$ $\quad$ $\mathbf{A} = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 0 & -1 \end{bmatrix}$

$\mathbf{K} \bullet \mathbf{A} = 0$ is again trivial: $\quad$ $\mathbf{K} = \begin{bmatrix} 1 & -1 \end{bmatrix}$

Multiplying by **R** and **K** we have:

$\mathbf{K} \bullet \mathbf{R} \bullet \Phi = \mathbf{K} \bullet \mathbf{R} \bullet \Phi_0$

In this case, we have only 1 kernel-phase



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