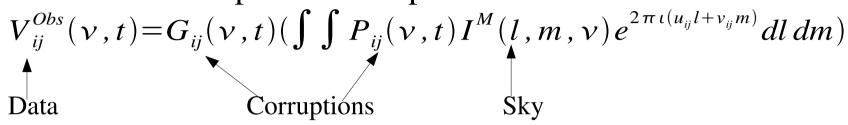
Imaging and calibration errors

• Most data corruptions are separable



 $G_{ij} = G_i G_j^*$ where G_i is the complex antenna based gains (direction independent) $P_{ij} = P_i(l,m)P_i(l,m)$ where P_i is the image plane errors (direction dependent).

- Assuming $P_{ij} = 1$, direction independent terms can be solved by minimizing: $\sum_{ij} |V^{Obs} G_i G_j^* V^M|^2 w.r.t. G_i's$
- Direction dependent terms remain separable in the visibility domain, but more expensive to apply (not simple division)

$$V_{ij}^{Obs} = E_{ij} * V_{ij}^{M}$$
 where $E_{ij} = E_{i} * E_{j}^{*}$; $E_{i} = FT[P_{i}]$

Challenges

- Explicitly incorporate the scale information in the deconvolution algorithms.
 - Widely separated pixels are coupled due to the sidelobes of the Point Spread Function (PSF). Fast computation of this coupling is a challenge.
 - > Decoupling the various scales in the image, or controlling the dimensionality of the search space is a challenge.
 - Solving for direction dependent corruptions as a function of time, frequency and polarization.
 - Incorporate these direction dependent effects while predicting the model visibilities.
 - Modeling the sky as a function of frequency and polarization

Roadmap: Wide-band imaging

(Note on "Imaging/calibration algorithm research", Aug. 2004)

- Wide-band imaging
 - → Formulate the problem
 - → Simulations/tests with existing algorithms
 - → Scale-sensitive decomposition as a function of frequency
 - → Incorporating PB effects in deconvolution

Roadmap: PB effects

- PB effects (pointing, squint, ionospheric/atmospheric)
 - → Formulate the problem: Done (EVLA Memo 84)
 - → Test cases: Done (EVLA Memo for the solver)
 - → Single pointing imaging tests: Done (in preparation)
 - → Solver: Tested for basic correctness.
 - → User level tool: Work in progress
 - Application of squint and pointing correction during imaging
 - Solver for pointing offsets

Roadmap: Component based Imaging

- Scale sensitive decomposition: Asp-Clean, MS-Clean
 - → Extend it to incorporate frequency dependence
 - → Simulations
 - → Extend the work on PB effects to work with the above during imaging

Roadmap: Inter-dependence

- Wide-band imaging needs
 - \rightarrow The basic Asp-Clean machinery for I(l, m, v)
 - → The basic PB machinery for forward and inverse transforms $P_{ij}(l, m, v)$
 - → Both the above for tests/simulations/actual algorithm development
- Full beam polarimetry
 - → The basic PB machinery for the transforms
 - → More sophisticated PB modeling
- Mosaicking
 - → Pointing Selfcal + all the above
- Estimation of computing/Data I/O needs