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Artificial intelligence applied to the automated analysis of absorption spectra

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- Motivation
- Genetic Voigt Profile FIT
- Application to
J110325-264515,
 $Z_{\text{abs}} = 1.839$
- Future Work



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Motivation



Physics Beyond the Standard Model



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Research Question



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**Can we remove the
human factor from
absorption spectra
modelling?**



GVPFIT Structure

Global Optimisation

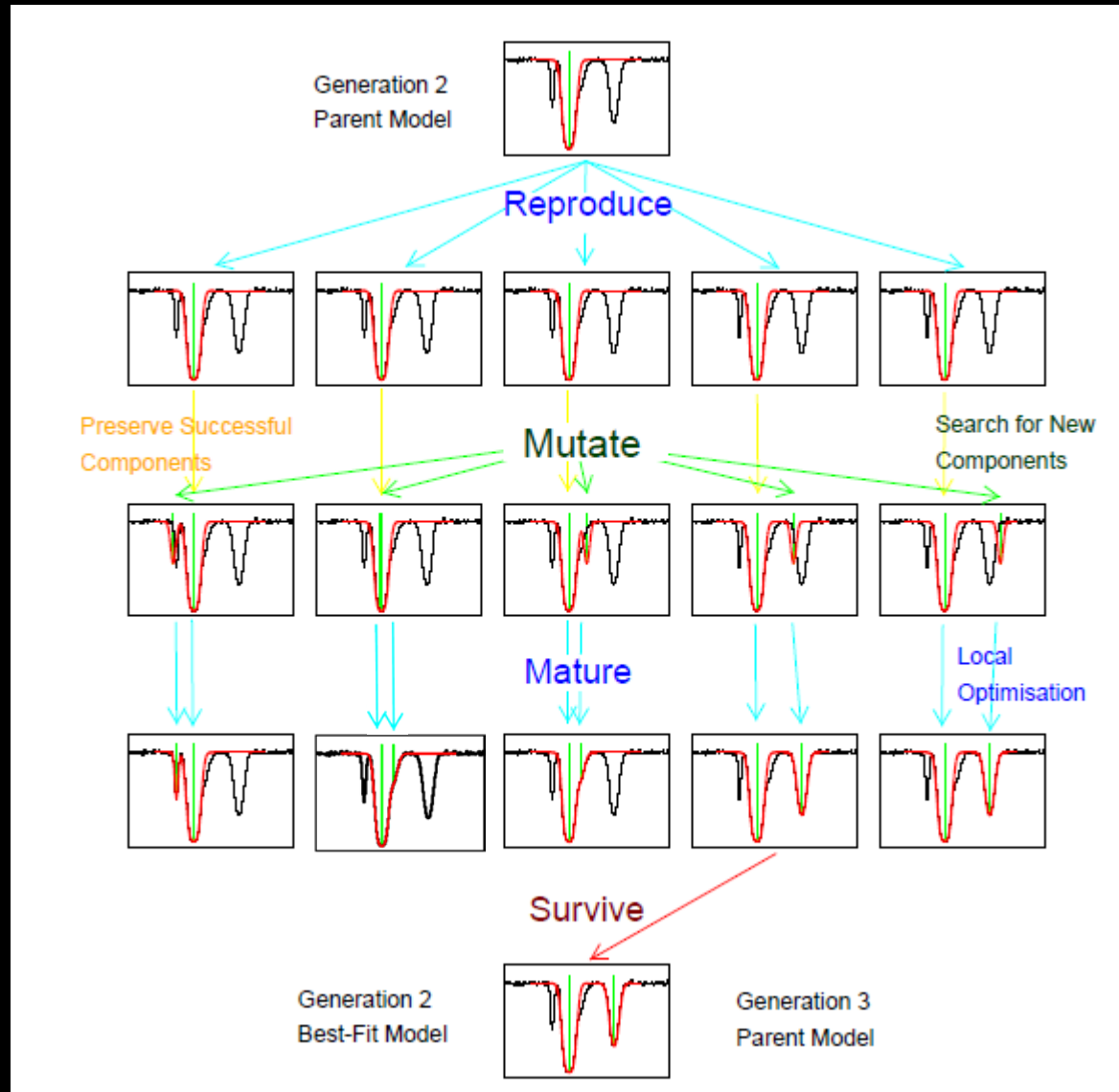
Genetic Algorithm

Local Optimisation

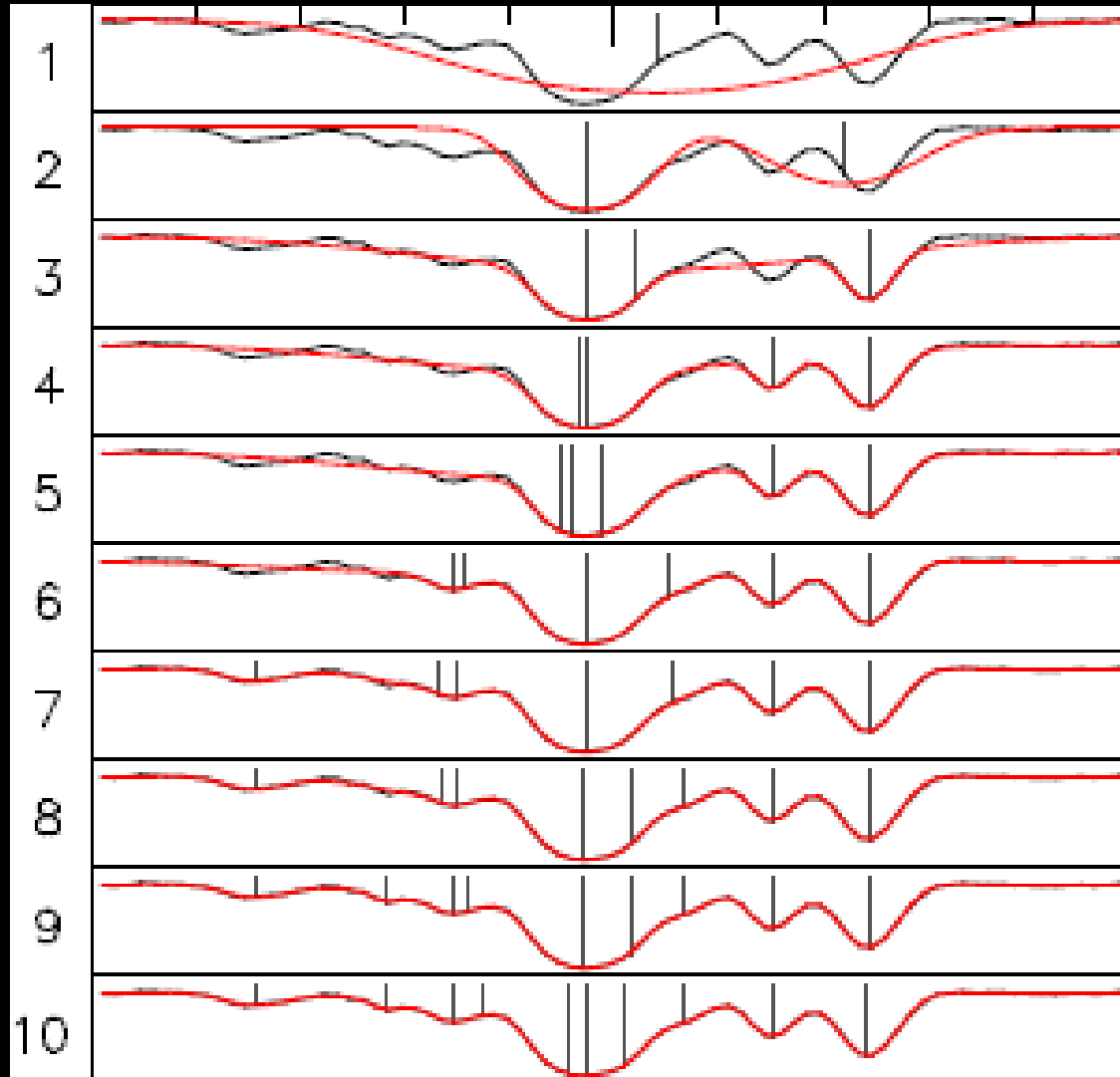
VPFIT

Hybrid Genetic
Algorithm

Hybrid Genetic Algorithm

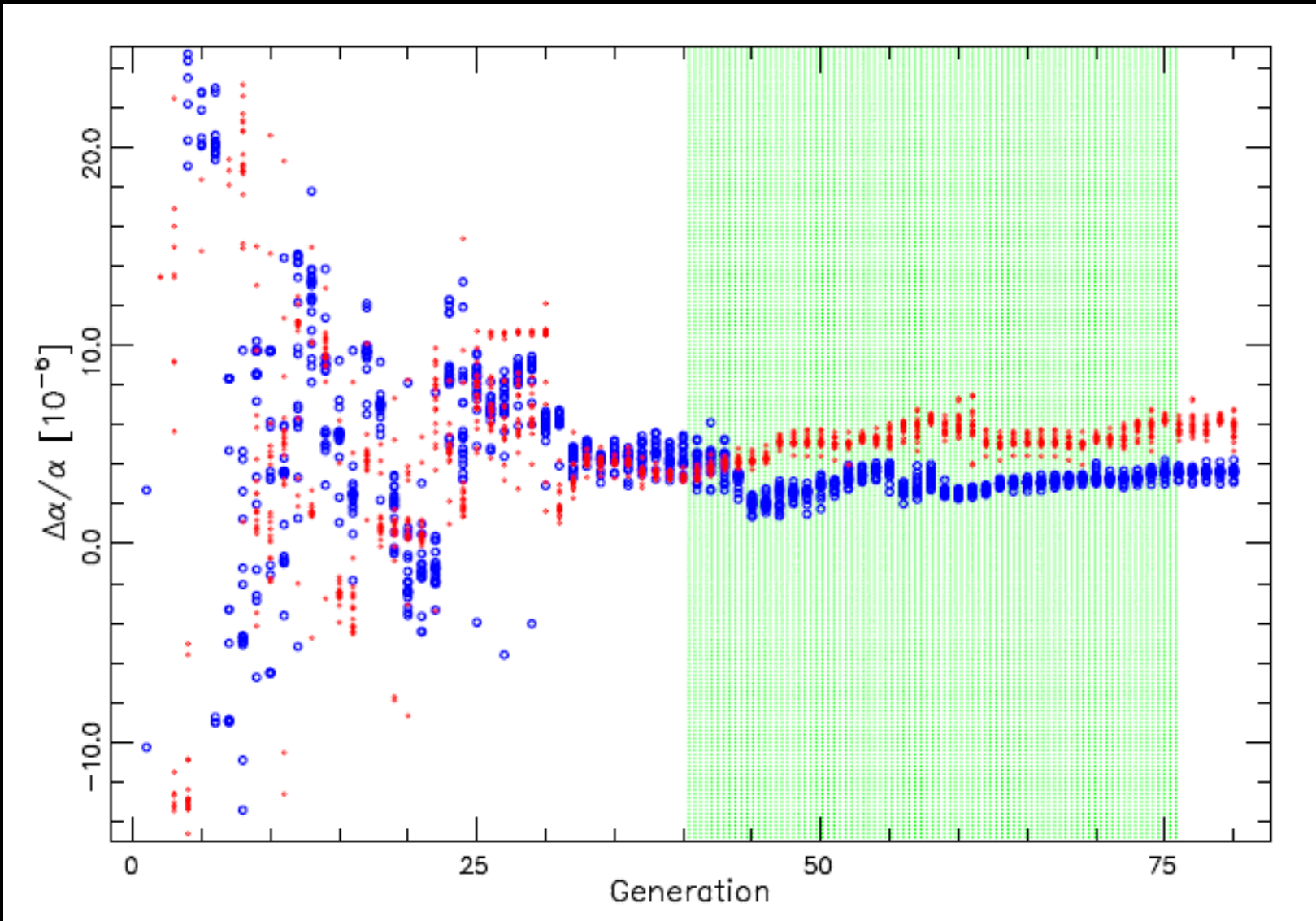


Building the Velocity Structure



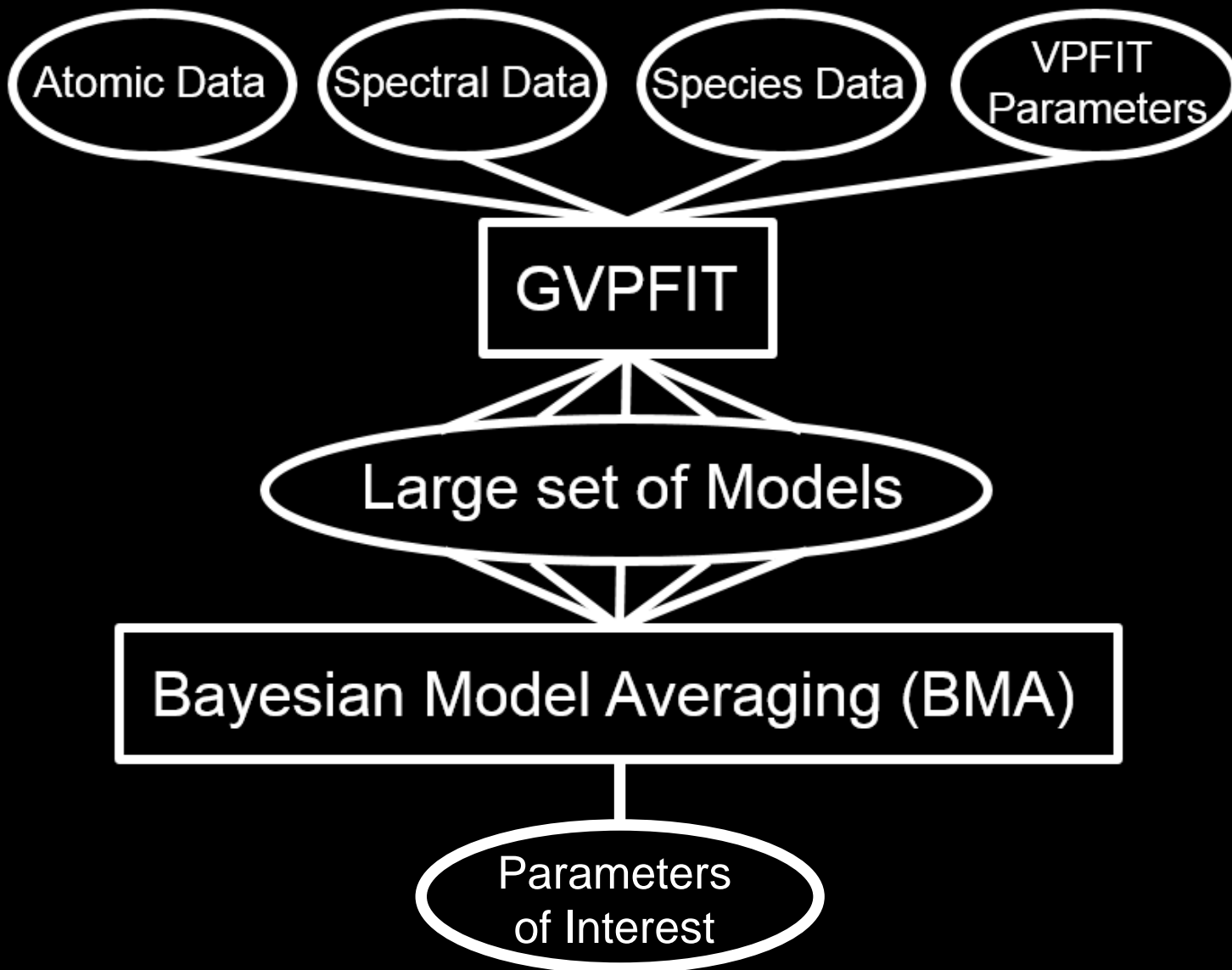


Large Set of Models





GVPFIT + BMA



Human
Interaction

No Human Interaction



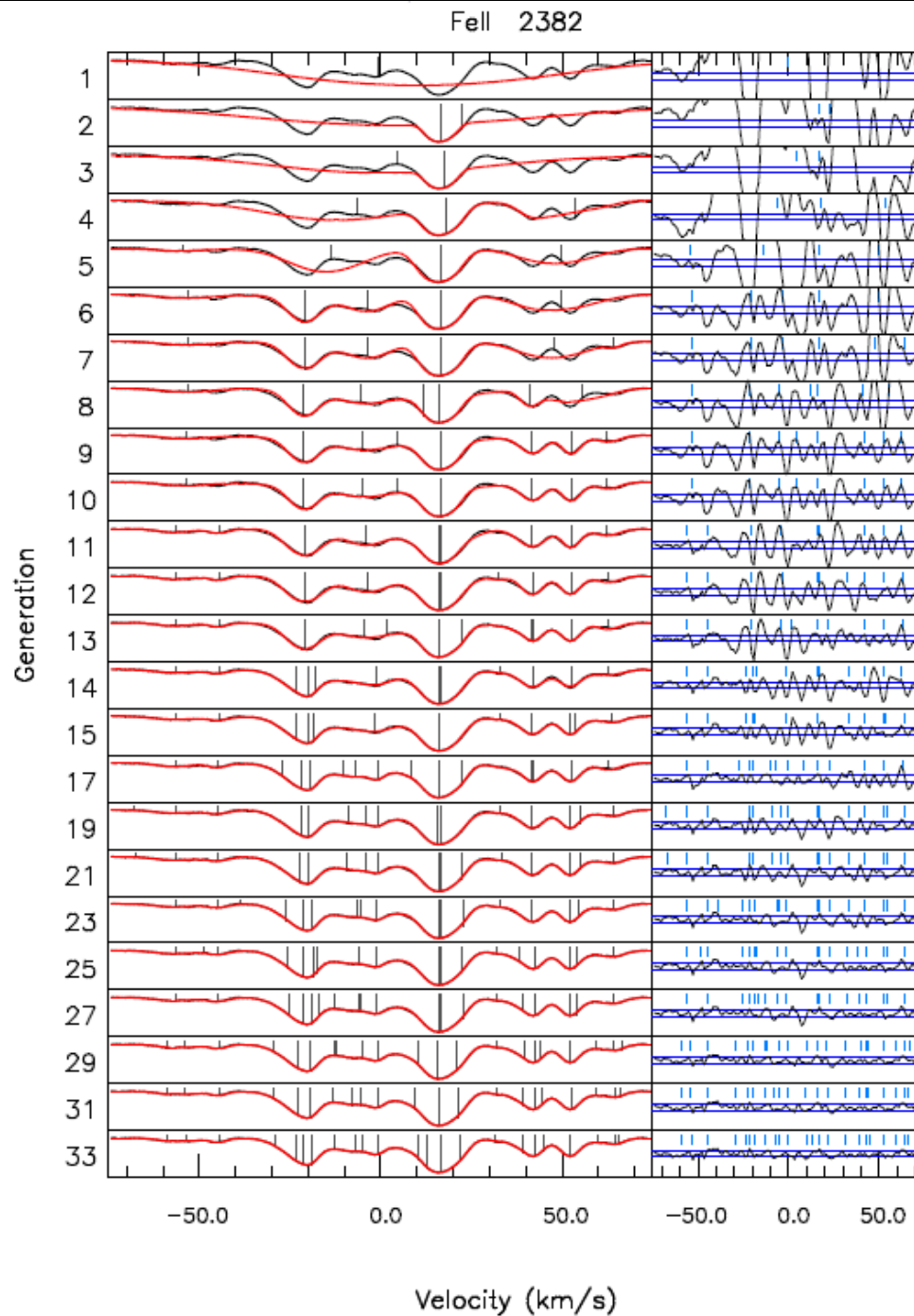
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$Z_{\text{abs}} = 1.839$

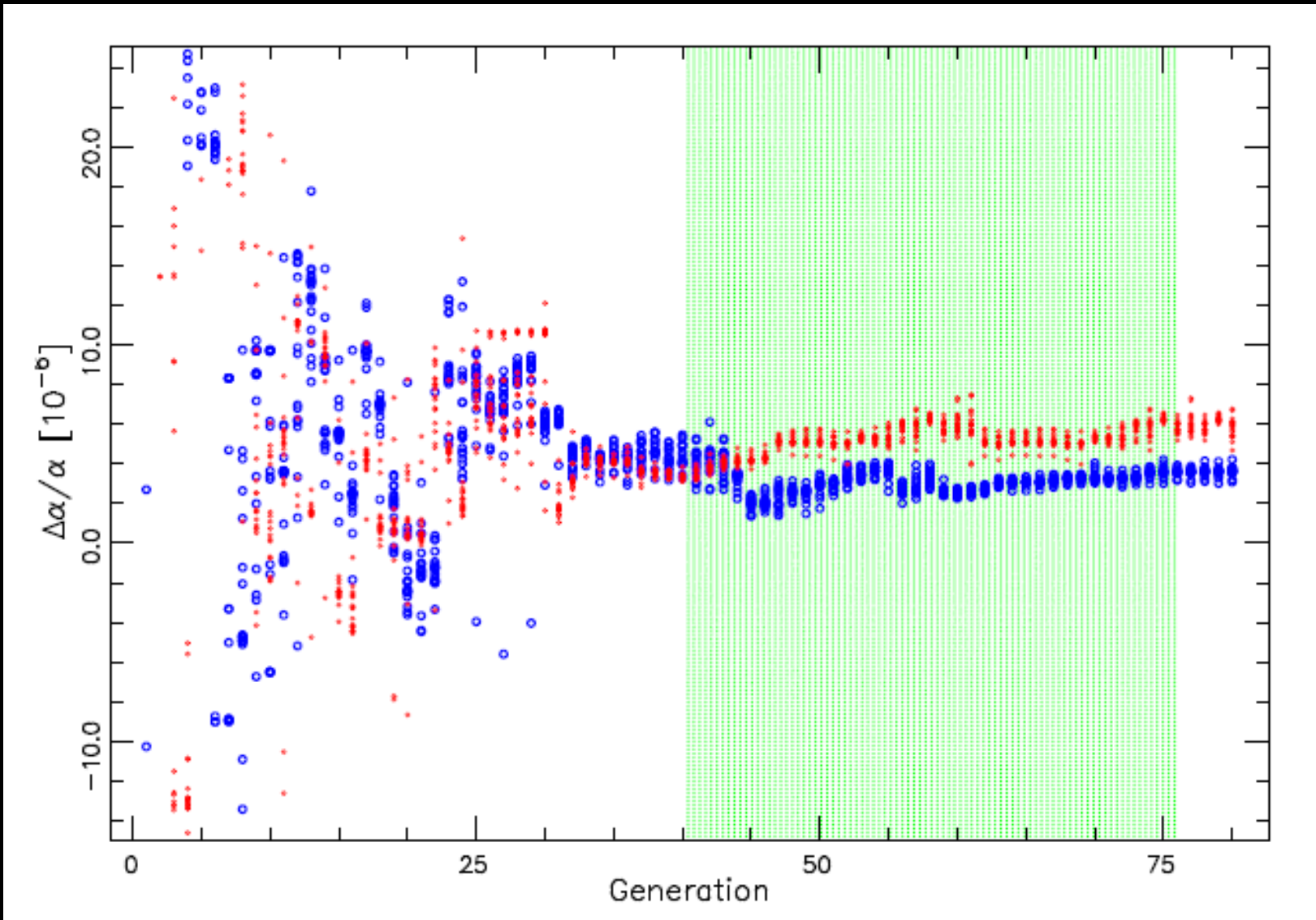


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Large Set of Models



Conclusions

GVPFIT:

- More objective
- More complete
- Faster



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Further Work



- Test GVPFIT using complex synthetic spectra
- Test/confirm Dipole result (King et al. 2012)
- Increase the number of varying α results



Questions?

- VPFIT: Voigt Profile FITting software,
(<http://www.ast.cam.ac.uk/~rfc/vpfit.html>)
- GVPFIT: Genetic Voigt Profile FITting software
(<http://arxiv.org/abs/1606.07393v1>)
- BMA: Bayesian Model Averaging
(<http://arxiv.org/abs/1606.07393v1>)