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BREAM – Exposure to pesticide vapours

Jan 2010
Final project workshop

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Vapour exposure model

- Emission of vapour from a treated field
- Dispersion of vapour in the environment
- Behaviour of a bystander within that environment
  - What happens in practice?
  - What is the worst that can happen?

Emission of vapour

- No resource within BREAM to develop a new model
- Empirical models suggest correlation between vapour pressure of active ingredient and vapour emission
- Predictive models generally not appropriate for our purposes – apart from Consensus-Pearl – but are also driven by vapour pressure of the a.i.
- Experimental data obtained in BREAM shows that vapour pressure is not always a good indicator….

Active ingredients used in vapour studies

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	epoxiconazole	fenpropidin
Vapour pressure, Pa	**4.5×10^{-7} / 1.0×10^{-5}**	**1.7×10^{-2}**
Solubility in water, mg/l	**8.42 / 7.0**	**530**
Henry Coefficient, Pa m^3/mol	**4.17×10^{-4}**	**8.77×10^{-3}**
Application rate, g/ha	**125**	**750**

Expt 1: Measurements of airborne concentration of two active ingredients applied as a tank mix – 2 m downwind

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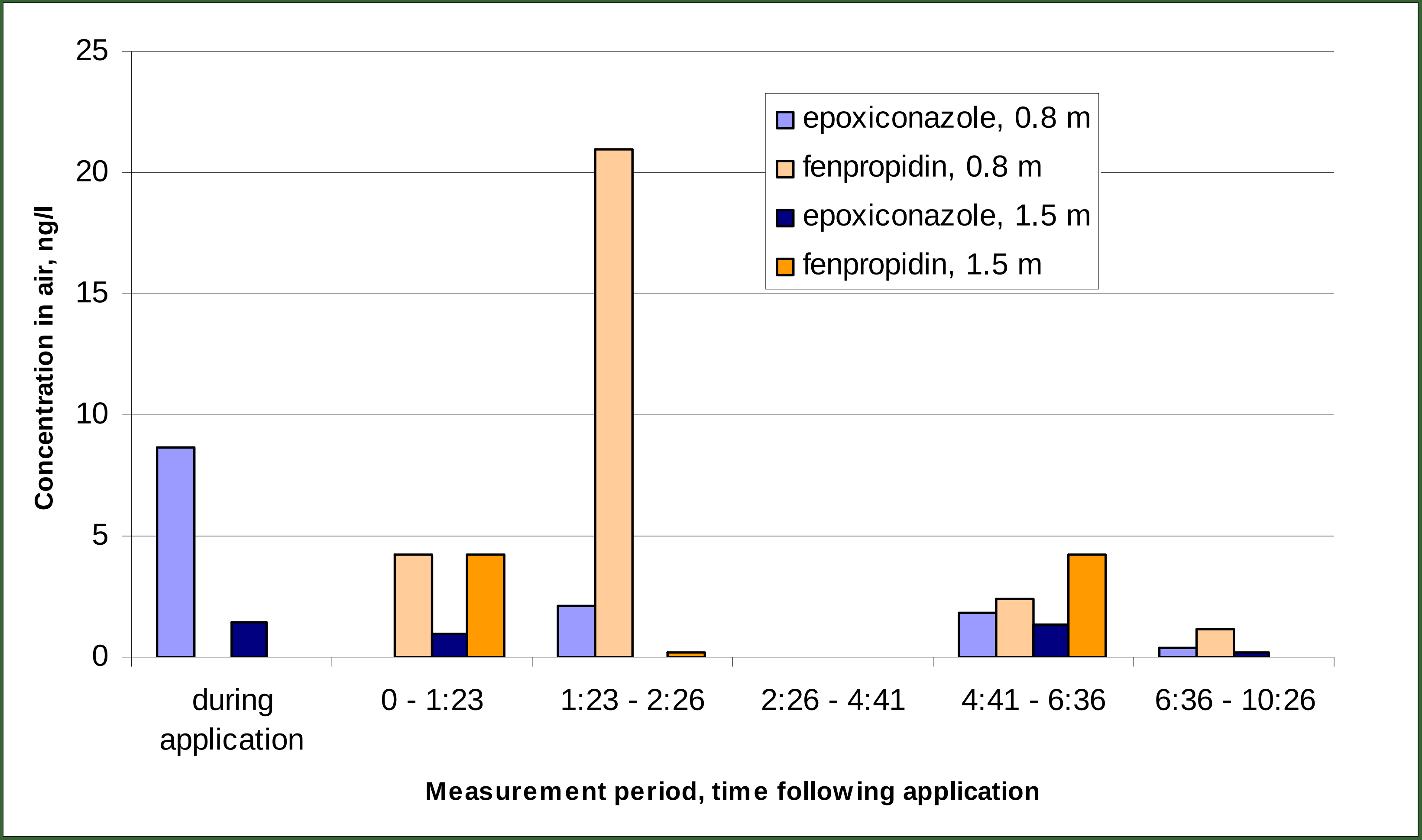

Expt 2: Measured concentrations of epoxiconazole and fenpropidin at two heights in the centre of the plot

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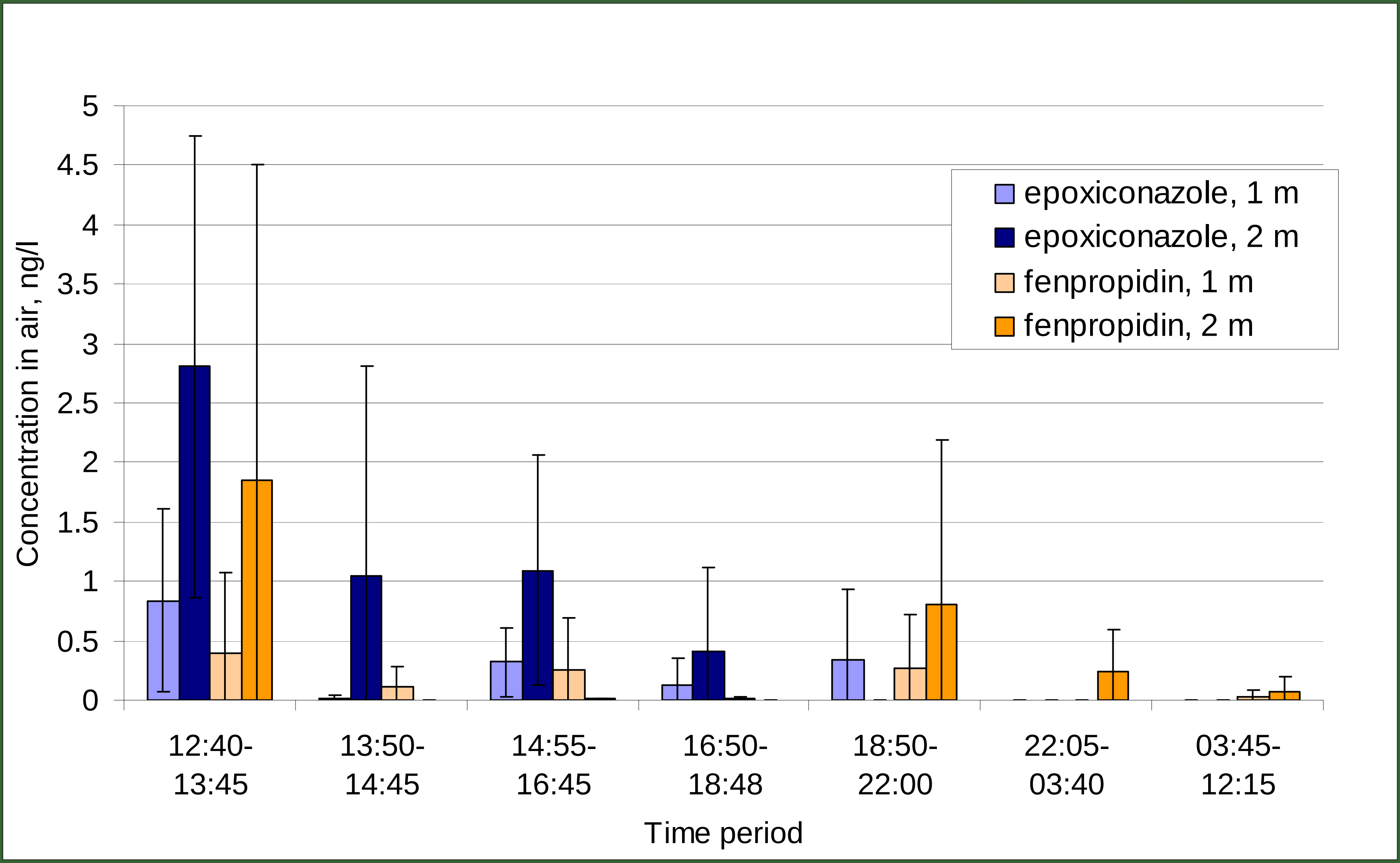

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Determination of emission rate from field plot

- Three different methods of determining emission rate tested
  - Based on met measurements and concentration measurements directly
  - Back-calculation from plume-dispersion model
  - Indirect calculation from residues on artificial targets
- Three different answers!
- Comparison with Consensus-Pearl predictions
  - Reasonable comparison between prediction and indirect estimate for fenpropidin only

Estimations of fenpropidin volatilisation rate, µg/m²/s

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Time	Calculation from field data according to Majewski et al	Field data, discs	ADMS calculation from field data	Prediction from Consensus Pearl
12:40-13:45	x	3.64	0.16	2.88
13:50-14:45	3.3×10^{-2}	0.93	5.2×10^{-3}	1.53
14:55-16:45	8.3×10^{-2}	0.15	1.34×10^{-2}	0.61
16:50-18:48	3.3×10^{-3}	x	5.0×10^{-4}	0.16
18:50-22:00	x	0.06	9.23×10^{-3}	3.0×10^{-2}
22:05-03:40	x	x	1.16×10^{-3}	4.0×10^{-3}
03:45-12:15	x	0.02	2.01×10^{-3}	6.0×10^{-4}

Volatilisation of fenpropidin – worst case estimates

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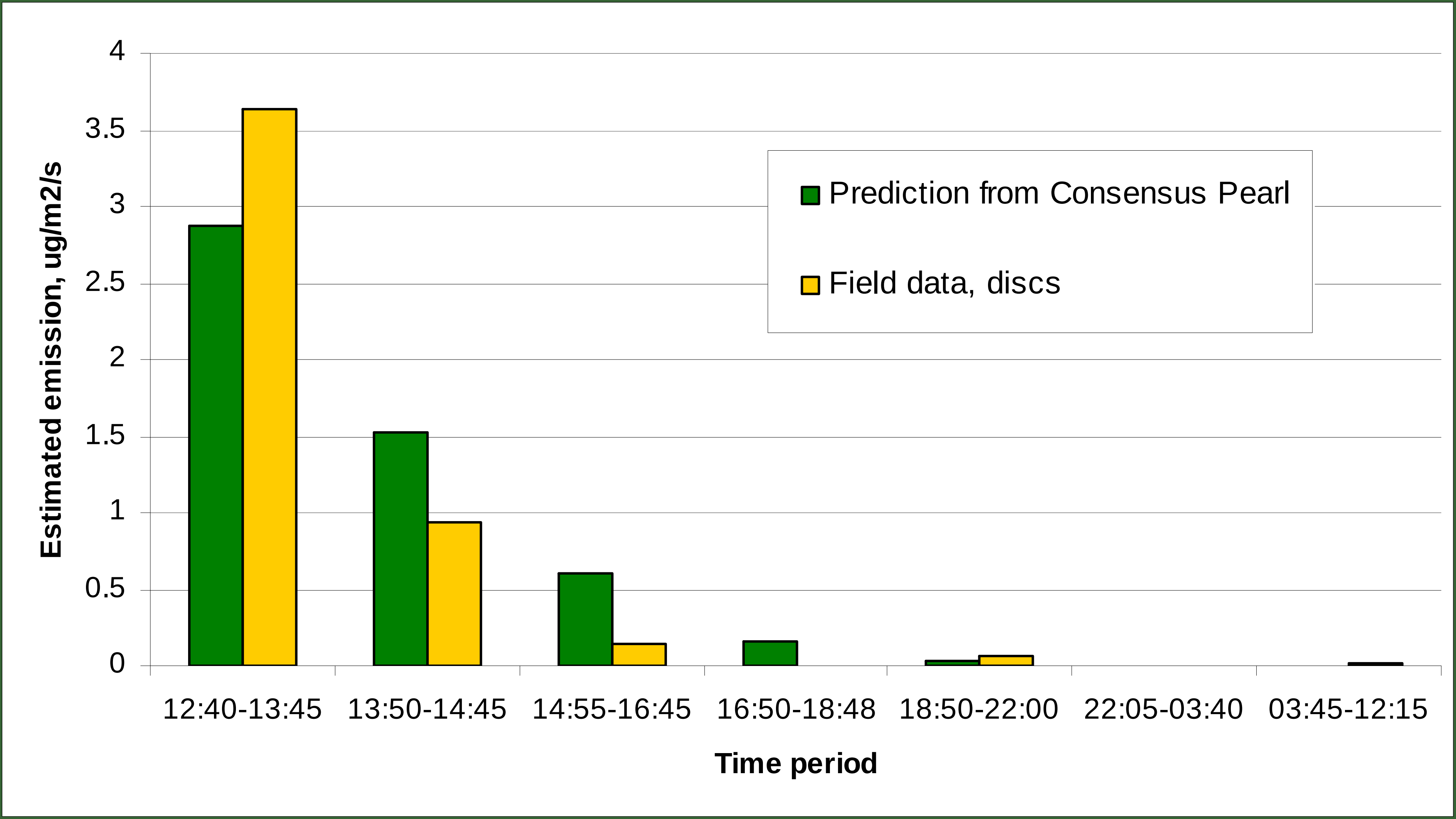

Model of vapour emission

- No influence of chemical properties
- No influence of meteorological conditions
- No influence of crop
- Based on applied dose
  - Worst case – 95% of applied dose in 24 hours volatilised
- Remains the area of greatest uncertainty

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Definition of scenario

Modelling investigations of

- **Meteorological conditions**
- **Source conditions**
- **Bystander location**

Decline of concentration downwind of a treated field

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