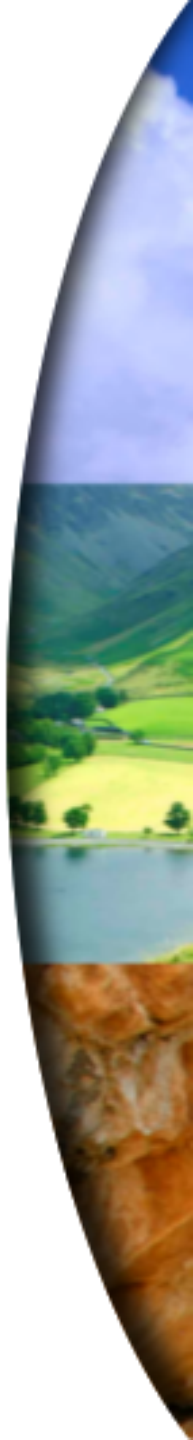




AMBER

Russell Walke

August 2012





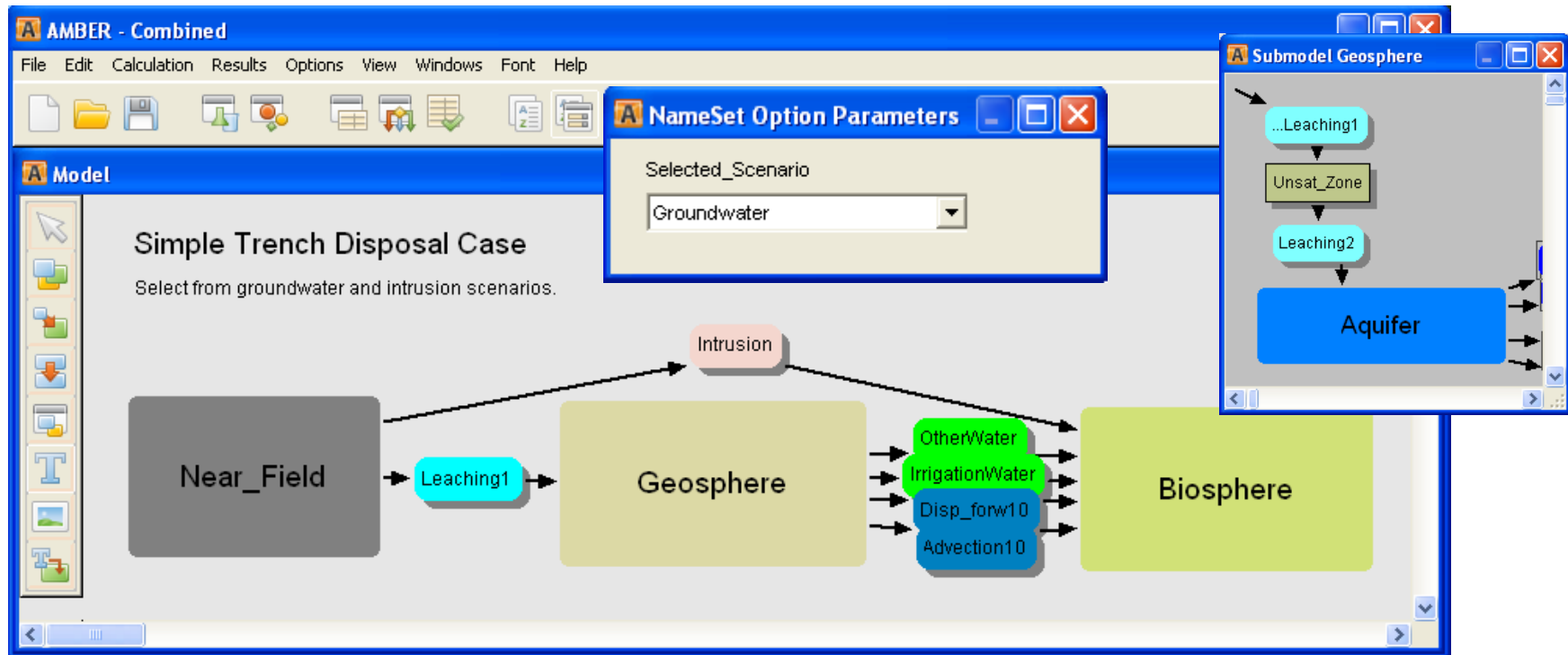
Outline

- What is AMBER?
- Philosophy
- Approach
- Flexibility
- AMBER and Quintessa
- Developments
- LLW Examples



What is AMBER?

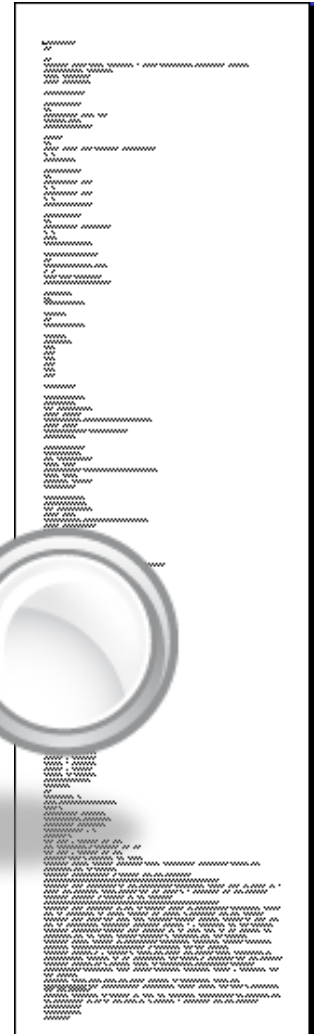
- Compartment modelling software
- Models trace contaminants in environmental systems
- Highly flexible, widely applicable
- Fast and robust solvers can model complex problems





AMBER: Philosophy

- Recognise importance of confidence building
- No 'black box' in-built models or data
 - User responsible for developing **their own** model
 - Encourages
 - Development of models that are appropriate
 - Transparent documentation of models and data
- Aim to provide maximum flexibility
 - Provide all tools necessary for implementing
- Transparency and auditability
 - Nothing is hidden
 - Text based files for comparison and QA





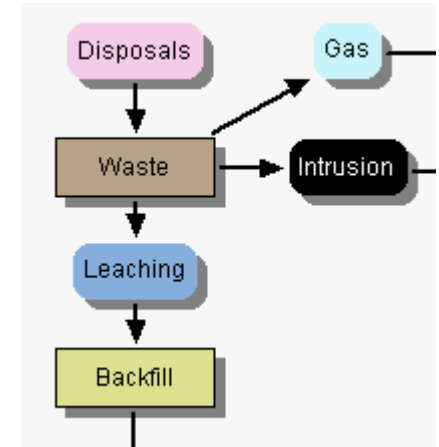
AMBER: Approach

- Discretise system into compartments and transfers
 - Use parameters to specify initial amounts, transfer rates etc.
 - AMBER solves for evolving amounts in compartments
 - Use parameters to calculate concentrations, doses, risks etc.
- Any number of user defined parameters
 - Data and expressions
 - Deterministic, probabilistic and/or time-dependent
 - Comprehensive range of mathematical functions
 - Efficient data handling via flexible indexing and ‘mapping’, e.g.
 - Mapping radionuclides to elements
 - Mapping compartments to ‘media’ (concrete, backfill, soil etc.)
- Comprehensive documentation, training and support
 - Including knowledge base of reports describing AMBER models



AMBER: Flexibility

- Can represent non-linearities
 - E.g. solubility limitation, irreversible sorption
- No limitations on size of model
 - Scoping through to regulatory applications
- Flexible 2D model layout
 - Can use sub-models to organise more complex systems
- Interface with other codes
 - Can import/export data with a range of layouts
- Can be driven externally
 - Run in batch mode with full range of commands
 - Use as a transparent 'engine' behind other codes

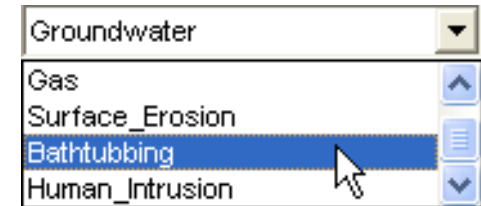




AMBER: Uncertainty

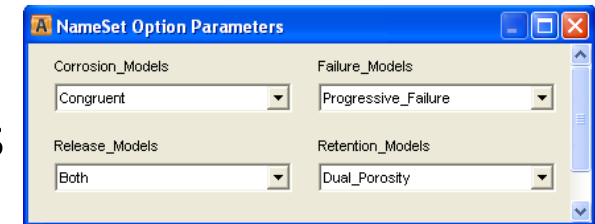
- Scenario uncertainty

- Data and models for different scenarios can be included in one case
- Efficient for cases with common inputs and models



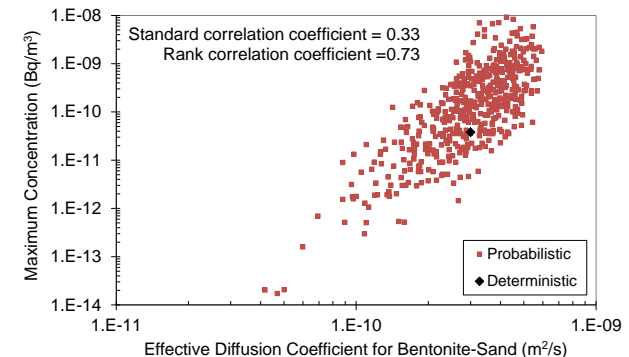
- Model uncertainty

- Flexibility to implement different models
- Units 'awareness' provides confidence



- Parameter uncertainty

- Full Monte Carlo or Latin hypercube
- Full or partial sampling
- Multiple deterministic runs



AMBER and Quintessa



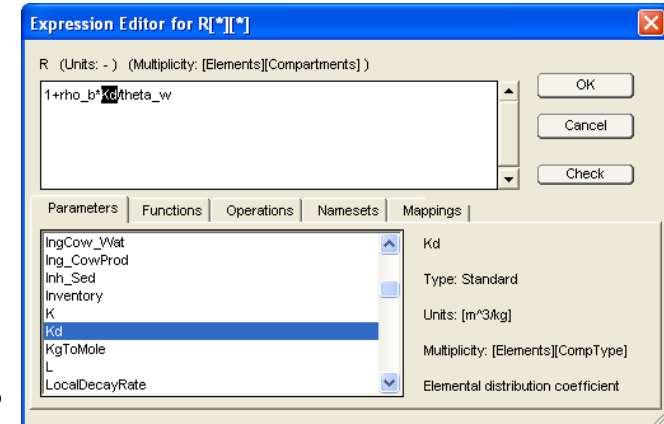
- Quintessa:
 - UK and Japanese scientific consultancy
 - Employee owned, long term stability
 - Safety assessment, decision support, maths and software
- AMBER is software product and a consultancy tool
 - We sell and support licences
 - We also develop it for our own use
- Committed to long-term support
 - Focus on PA and safety assessment
 - On-going development and annual releases
 - Continuing to invest
 - Accredited software development process





AMBER: Developments

- Recent
 - Expression editor
 - Greater ease of development and checking of expressions
 - Annotation of data/expression entries
 - Aids transparency and QA checking
- Forthcoming
 - Self-referencing parameters
 - E.g. facilitates simple water-balance calculations
 - History files
 - Full track of case file development
 - Multi-platform interface



	Soils
<default>	
H	0
C	0.005
Tc	0.01



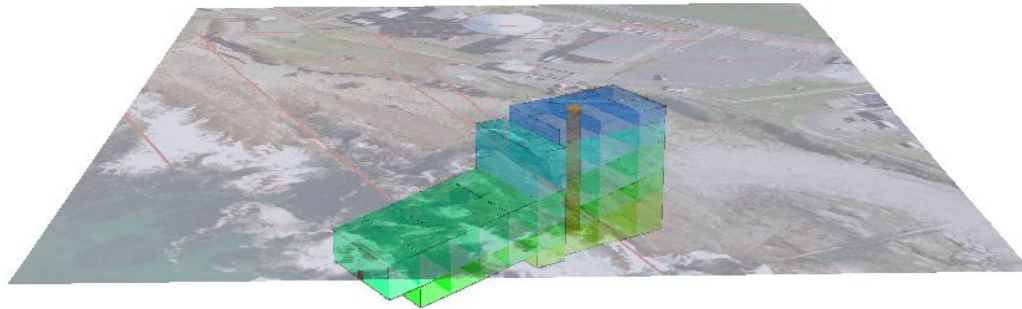


AMBER: LLW Examples

- IAEA
 - ISAM cases and training
 - Waste acceptance criteria
- UK
 - Dounreay LLW, VLLW, LLW Pits
 - Hunterston near-surface graphite
 - LLWR 2002 Safety Case
- Canada
 - OPG assessment of options
 - DGR licence application
- Sweden
 - SFR near-surface L&ILW facility
- Italy
 - National siting for surface facility
- Japan
 - Rokkasho surface LLW facility
- China
 - Nuclear Safety Centre assessments
- Russia
 - RADON near-surface facilities
- Lithuania
 - Near-surface LLW facility
- Slovenia
 - Assessment of options
 - L&ILW silo
- Romania
 - Baita Bihor geological LLW facility
- South Africa
 - Pelindaba surface LLW facility



Thank you for your attention



www.quintessa.org/amber

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