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MACCS2

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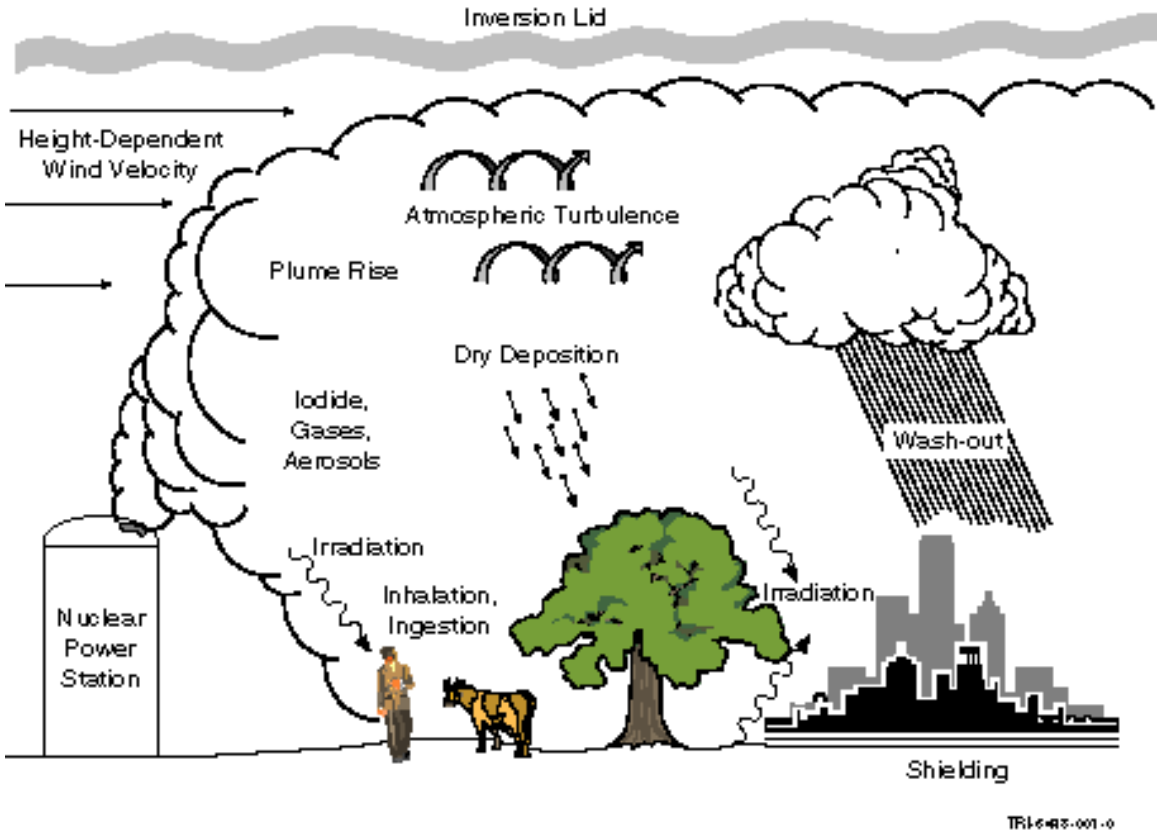
Outline

- Uses
- Recent and Ongoing Development
- Future directions



NRC Uses for MACCS2

- MACCS2 is used to analyze offsite consequences from an accidental atmospheric release of radioactive material.
  - Early and latent health effects
  - Land contamination
  - Economic impact
- Types of uses:
  - Support level-3 PRA analyses
    - MELCOR source-term predictions
  - Planning
  - Cost-benefit analyses

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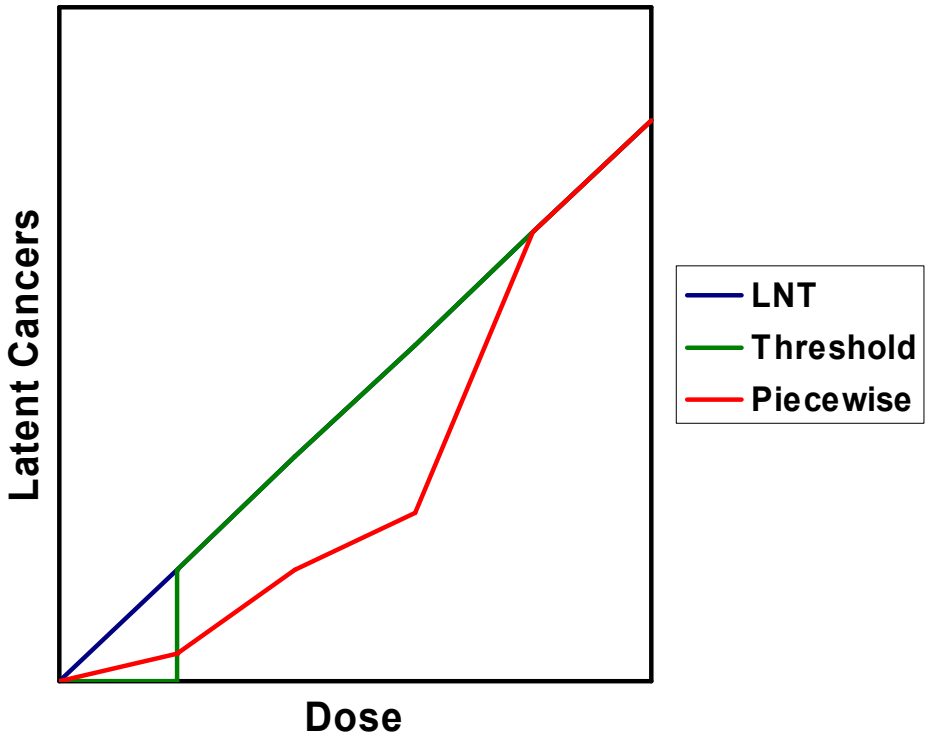
MACCS2 Development

- Recent and ongoing development (RES/DSARE)
  - New capabilities (Y6786)
    - KI ingestion model
    - Land-contamination estimation
    - Dose-threshold model
  - Pursuit of best-estimate modeling
    - Improved dose threshold model for latent health effects
      - Annual/lifetime threshold
      - Piecewise-linear dose model
    - Enhanced plume modeling
      - Buoyancy
      - Dispersion
    - Improved model for mixing height
  - MACCS2 inputs (Y6628)
    - Distributions to capture degree of belief



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Supporting Development

- **WinMACCS development (Y6628)**
  - **Input file builder**
    - **Single run**
    - **Multiple runs**
    - **Multiple realizations using LHS for parameter sampling**
  - **Graphical display of output**
- **MELMACCS development (Y6802)**
  - **Tool for calculating source terms from MELCOR output**
  - **Creates MACCS2 input**

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MACCS2 Training

- Accident consequences analysis training (P-301) for the NRC (Russ Anderson through INEEL)
- Training and support for Kalinin PRA (John Lane through BNL)
- Training workshop for DOE's Severe Accident Working Group (SAWG)

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Recent and Ongoing Applications - Vulnerability

- NPP vulnerability to aircraft
  - Surry & Peach Bottom (RES/DET)
  - Indian Point & Limerick (RES/DSARE)
  - Sequoyah & Grand Gulf (RES/DSARE)
- Vulnerability of spent fuel pool (done by RES)
- Vulnerability of fuel in dry-cask storage (NMSS/SFPO)
- Research and test reactor (RTR) vulnerability (35 sites) (NRR/DRIP)
- Vulnerability of Greek Demokritos reactor for 2004 Summer Olympics

Recent and Ongoing Applications – Other NRC

- Plume model adequacy evaluation (RES/DSARE)
- Evaluation of competing evacuation/sheltering strategies (NSIR/EPPO)
- Rebaselining NUREG-1150 consequences for CRIC-ET (RES/DSARE)
  - Used to evaluate risk-significance of candidate generic issues

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Future Directions

- Driven by trends in advanced reactors and fuels
  - High-burnup fuel
  - MOX fuel
  - PBMR
  - ACR 700
- Consequence analyses will require
  - Reactor- and fuel-specific fission-product inventories
  - Routine quantification of input and weather uncertainties
  - Quantification of effect of a dose threshold
  - More cohorts
- Focus should be to improve models strategically to minimize unnecessary regulatory burden

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Future Code Needs

- Integrated weather and input parameter sampling
- Threshold model for multiple cohorts
- Faster run times
  - Improved code architecture
  - Dynamic memory allocation
  - Distributed computing
- Support for multiple fission product inventories
- Improved models for rate-dependent health effects
- More flexible and detailed economic model

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Future Data Needs

- Access to more and better data
  - Surface roughness
  - Land use
  - Diurnal variations in population
  - Economic Data
  - Weather data

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