Agricultural Policy/Environmental eXtender

Recent Activities and Developments (2013-2017)

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APEC/EPIC Bibliography

Search Period: 2013-2017

- Journal papers, 168
- Thesis, 14
- Conference paper, 21
- Books, 9

Google Scholar keyword searching
- Agricultural Policy Environmental Extender
- Environmental Policy Integrated Climate

Over 210 listings identified after manually inspected/filtered

<table>
<thead>
<tr>
<th>Frequency of articles by journal</th>
<th># papers</th>
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<tr>
<td>Transactions of the ASABE</td>
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<tr>
<td>Journal of Environmental Quality</td>
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<tr>
<td>Journal of Soil and Water Conservation</td>
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<tr>
<td>Agricultural Systems</td>
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<tr>
<td>Environmental Modelling &amp; Software</td>
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<td>Ecological Modelling</td>
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<td>Agricultural Water Management</td>
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<td>Agriculture, Ecosystems &amp; Environment</td>
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<td>Climate Change Mitigation and Agriculture</td>
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<td>GCB Bioenergy</td>
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<td>Journal of Environmental Management</td>
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<td>Journal of Integrative Agriculture</td>
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<td>Natural hazards</td>
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<td>Nature</td>
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<td>Science of The Total Environment</td>
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<td>Other journals</td>
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<th>Types of study</th>
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<td>Climate change</td>
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<tr>
<td>Crop growth/production</td>
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<tr>
<td>Conservation practices</td>
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<tr>
<td>Model development/Integration</td>
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<td>Cropland Hydrology/water availability</td>
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<td>Water quality</td>
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<td>Review</td>
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<td>Bioenergy</td>
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<td>Optimization/SA/DS</td>
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<td>Phosphorus transport</td>
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<td>Soil erosion</td>
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<td>Soil organic carbon</td>
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<td>Crop Insurance/Economical Analysis</td>
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<td>Nitrogen fate/transport</td>
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<td>GHG</td>
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<tr>
<td>Other topics</td>
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User manual

- APEX/EPIC user manual is now available in multiple languages
  - English (updated 2017)
  - Spanish (2017)
  - Korean (2015)
  - Persian (2017)
  - Chinese version is on the way
Training workshops

- **Upcoming workshops**
  - July 17-21, 2017, Sardinia, Italy
  - November, 2017, Universidade Federal de Mato Grosso, Brazil
  - January, 2018, India

- **Past workshops (20+)**
  - Quito, Ecuador – May 1-5, 2017
  - Temple, TX – April 18-20, 2017
  - Jeonju, South Korea – October 5-7, 2016
  - Temple, TX – September 7-9, 2016
  - Changsha, China – August 2-3, 2016
  - Lincoln, NE – April 12-14, 2016
  - Temple, TX – January 26-28, 2016
  - Accra, Ghana – February 1-5, 2016
  - Addis Ababa, Ethiopia – February 8-12, 2016
  - Purdue University, October 2015
  - Morogoro, Tanzania, July 2015
  - Sardinia, Italy, June 2015
  - Beltsville, MD, May 2015
  - Bahir Dar, Ethiopia, February 2015
  - Quito, Ecuador, 2013
  - Addis Ababa, Ethiopia, 2013
  ...
Supporting Tools

- WinAPEX development for .NET framework (by 2017)
- ArcAPEX for APEX1501 now supports ArcGIS 10.3
- APEX-CUTE 4.3
  - Calibration
  - Sensitivity Analysis
- APEX-EDITOR
  - Edit input files
APEX/EPIC Developments

1. APEX Bacteria model
2. Preferential grazing
3. APEX Paddy model
4. Soil moisture simulation
1. APEX-Bacteria model

Microbial fate and transport module

Hong et al. (submitted)

Slide contributed by Eunmi Hong, USDA-ARS, Beltsville, MD
1. APEX-Bacteria model

Tonepi watershed Study

Area: 1,538 ha
Rainfall: 1,306 mm
Landuse: pasture with intensive grazing all year round

Streamflow

R2: 0.63-0.77, NSE: 0.54-0.67

E. Coli concentration

NSE: 0.33; RMSE: 0.63-0.82

Slide contributed by Eunmi Hong, USDA-ARS, Beltsville, MD
2. APEX preferential grazing

- **PHYtomass GROWth Model**
- Characterizes complex grazing systems and herbivories
- Preferential grazing between different plants
- Multiple herds in a subarea to graze
- This version is available in APEX 1605

- Standing live mass was predominantly C3 grass from May until ~1 Aug.
- C3 mass peaked in early July
- C3 grass had a small increase in mass in autumn
- C4 peaked ~ 1 Sept.

![Graph showing Standing live mass (Mg ha⁻¹) over day of year.](image)
3. APEX-paddy model

Discharge

- Observed
- Predicted
- Rainfall+Inflow

No ponding/IRR

Intermittent IRR

N yield

- Observed
- Predicted

Mineral N [kg/ha]

- Fertilizer

Choi et al. (submitted)
4. Dynamic soil moisture simulation

\[ K_{\text{eff}} = HC \times \left[ \frac{ST - FC}{PO - FC} \right]^\varepsilon \]

Daily soil moisture content at the OEN site

High flows improved significantly in the Y2 watershed

Study sites
Future plan (5 yrs)

- Soil temperature
- Soil chemistry (reactive transport of metal ions)
- APEX-MODFLOW
- Lateral overland flow routing
- AERO wind erosion
- Southern Oscillation Index for WXGEN
- QGIS Integration
- Pest dynamics & pesticide modules
Summary

• EPIC and APEX modeling community is growing
• Most applications are on climate change effects, food production, and conservation practices
• Spatial scale varies from field scale to continental scale with model integrations and the incorporation of GIS
• New subroutines are continuing to be developed for simulating new processes, managements, and systems
• Model developers at Texas A&M are committed to support the growing APEX/EPIC model community