Ref: ENVSOFT\_2019\_470

Title: An Agricultural Water Use Package for MODFLOW and GSFLOW

Journal: Environmental Modelling and Software

Dear Dr. Niswonger,

Thank you for submitting your manuscript to Environmental Modelling and Software. I have received comments from reviewers on your manuscript. Your paper should become acceptable for publication pending suitable minor revision and modification of the article in light of the appended reviewer comments.

When resubmitting your manuscript, please carefully consider all issues mentioned in the reviewers' comments, outline every change made point by point, and provide suitable rebuttals for any comments not addressed.

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Click on 'Agree to Revise'

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I look forward to receiving your revised manuscript as soon as possible.

Kind regards,

Dr Ames

Editor-in-Chief

Environmental Modelling and Software

Comments from the editors and reviewers:

-Reviewer 1

- This is a well-written manuscript that describes a comprehensive package for MODFLOW that is capable of incorporating agricultural aspects into hydrological modelling. My comments below are very minor (mostly editorial in nature) and refer to line numbers generated by the journal:

**Thank you for the positive feedback and constructive review comments. I really appreciate your time in reviewing this article. Please see my replies below in bold. Lines numbers used by author refer to new lines numbers defined in MS Word.**

L62: capitalize 'Agricultural' ?

**Reply: Done**

L206: 'we' ? - off given this is a single author paper

**Reply: Removed word “we” on lines 75-76 by changing text to read: “Here an Agricultural (AG) water use package is presented for MODFLOW and GSFLOW regional-scale simulations.”**

L208: it would be worthwhile to even loosely quantify what is meant by 'regional-scale'

**Reply: Added phrase on line 76: “river-basin scale”**

L353: typo? 'continuity and Manning's equations'

**Reply: Deleted extra “s” on line 143.**

L432: not sure I understand why mapped identifiers would change during a simulation - maybe briefly explain

**Added explanation on lines 183-185: “Mapping identifiers are input to the AG input file, and they can change during a simulation to represent changes in withdrawal locations or irrigated lands.”**

L648: yellow diversion symbols and grey irrigation wells are tough to see on Figure 1

**Reply: changed figure 1 to make symbols for diversions and wells larger.**

L2117: the 'Discussion' reads more like a 'Summary' - some more discussion regarding the advancement of new AG package compared to OWHM and FMP2 would be useful - even just a few sentences based on the authors experience

**Reply: I added the following comparison to the FMP2 on Lines 651-659: “Existing software used to simulate agricultural water use in regional hydrologic models do not provide capabilities of the AG Package. The MODFLOW-based package called the Farm Process requires monthly time steps, and it does not simulate soil-water balance for the estimation of irrigation withdrawals and 〖ET〗\_a (Hanson et al., 2014). The AG Package simulates daily soil-water dynamics that play an important role in determining irrigation schedules and amounts. Soil-water balance is important for representing the rain-fed component of crop consumption required for estimating irrigation withdrawals (Senay et al., 2014; Allen at al., 2007). Landsat derived 〖ET〗\_a can be integrated through soil-water balance into hydrology models that represent both agricultural systems and the broader regional to national hydrologic system.”**

-Reviewer 2

**This is a very thorough review that has greatly improved the manuscript. Thank you for your constructive review comments. I really appreciate your time in reviewing this article. Please see me replies below in bold. Lines numbers used below in replies by author refer to new line numbers defined in MS Word.**

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1.) My most significant comment is that the manuscript should provide a detailed comparison of the new AG package to other similar software available for MODFLOW/GSFLOW (and/or other codes), particularly the USGS Farm Process Version 2 (FMP2) [mentioned only briefly at line 180]. According to documentation for FMP2 it fills a very similar role and has a very similar set of capabilities as the AG-package. It is unclear therefore why the author has decided to create this new package, without further explanation of the different capabilities of AG to FMP2 and how each is applicable to different problems. This could be in the Introduction and/or the Discussion section.

**I added the following descriptions that compares FMP2 to the AG Package:**

**Lines 67-74: “Another example is the Farm Process for MODFLOW-2005 that assumes the irrigation demand is independent of a farm’s soil water content, and that precipitation can be subtracted from reference ET to account for rain-fed crop consumption (Hanson et al., 2010, 2014). Another approach presented herein is to include simulation of soil-water balance within the regional hydrology model to better represent soil-water in irrigated lands. The advantage of this approach is that simulated soil water conditions can be used to estimate the rain-fed component of crop consumption for the estimation of irrigation withdrawals (e.g., Huntington et al., 2017).”**

**Lines 651-659: “Existing software used to simulate agricultural water use in regional hydrologic models do not provide capabilities of the AG Package. The MODFLOW-based package called the Farm Process requires monthly time steps, and it does not simulate soil-water balance for the estimation of irrigation withdrawals and 〖ET〗\_a (Hanson et al., 2014). The AG Package simulates daily soil-water dynamics that play an important role in determining irrigation schedules and amounts. Soil-water balance is important for representing the rain-fed component of crop consumption required for estimating irrigation withdrawals (Senay et al., 2014; Allen at al., 2007). Landsat derived 〖ET〗\_a can be integrated through soil-water balance into hydrology models that represent both agricultural systems and the broader regional to national hydrologic system.”**

2.) I would like to see results of AG package compared to other similar codes and the "pre-processing" mentioned in order to provide verification of AG and/or highlight differences in results based on the method used.

**Reply: This paper provides a new approach for simulating agricultural water use in integrated models. Quantitative comparisons to other models are beyond the scope of the paper. A comparison would be difficult to evaluate. I will leave it to follow up studies to attempt these comparisons if necessary.**

3.) Line 227: Provide explanation of these recent enhancements. In particular it should be clarified how AG-package can represent changes in land use, as this is a useful capability that is not currently discussed in the manuscript.

**Reply: For details about representing changes in land use in GSFLOW, users can refer to the provided reference (Regan and LaFontaine, 2017). The following sentence was added to Lines 80-83 for clarity:**

**Changes in land use can be simulated using the dynamic parameters capability in GSFLOW that can represent changes in vegetation cover type, crop coefficients, and other input parameters that vary with change in land use (Regan and LaFontaine, 2017).**

4.) General comment (e.g., line 253) - there are so many different codes it may be helpful to have a table that summarizes each, and brief discussion of their capability. Also, I prefer the term 'code' when discussion a software platform and 'model' for when a code is applied to a specific problem.

**Reply: Because GSFLOW and MODFLOW come with detailed documentation, including all the different “codes” that are part of these software, I think that adding such a table is redundant with the many on-line sources that provide detailed lists and descriptions of these codes. For example:** [**https://water.usgs.gov/ogw/modflow-nwt/MODFLOW-NWT-Guide/**](https://water.usgs.gov/ogw/modflow-nwt/MODFLOW-NWT-Guide/)

5.) Section 4.1.1 - How is irrigation duration/application rate defined? Application rate can have a significant impact on the amount of runoff generated, for example.

**Reply: The following sentence was modified to clarify how irrigated rates are specified/determined by the model on lines 131-133: “Surface water demands for diverting irrigation water and applying it to fields can be set by user-specified values, or they can be calculated by the model using field-based crop-water demands.”**

6.) Line 303: It is not the case that in practice irrigation water is always only diverted from one location, it is often the case that irrigation is provided to one field from multiple locations (diversions, wells, etc).

**Reply: I agree, and as stated in several locations for example 174-176: “A diversion and/or well can provide water for multiple cells/HRUs, or multiple diversions and/or wells can provide water for a single cell/HRU. Additionally, a well can supplement several diversions, or several wells can supplement one or more diversions.”**

7.) Line 372 - this sentence is unclear, please define "open detention storage reservoirs" and clarify if the LAK package is used for this in GSFLOW.

**Reply: As noted on lines 143-145 open detention reservoirs are not the same as the Lake package as this sentence makes a clear distinction between the 2 and provides different references for these. As we are talking about representing surface reservoirs, it is clear that open detention reservoirs are surface reservoirs, and I provide a reference if the reader is interested in additional details: “Surface reservoirs are simulated by the MODFLOW Lake (LAK) Package (Merritt and Konikow, 2000) for MODFLOW simulations and/or open detention storage reservoirs for GSFLOW simulations (Regan and LaFontaine, 2017).”**

8.) Line 400 - "pumping rates are specified" is inconsistent with the following discussion, because in some cases the pumping rate is not specified but is calculated based on crop demands.

**Reply: Line 152: the qualifier “maximum” was added before the phrase “pumping rates are specified” to indicate that these values represent maximum thresholds when pumping amounts are calculated by the model.**

9.) Line 402 - Please clarify, if the well is used for irrigation then it is not also in the WELL package? How is a well handled that is used for both irrigation supply and other uses, such as domestic supply (as is fairly common)?

**Reply: I added additional details to clarify how different types of wells are represented in a simulation. Lines 152-157: “Wells are defined, and maximum pumping rates are specified, within the AG Package input file. Irrigation wells are assumed to have a screened interval that spans the model cell thickness, and smoothing functions are used to reduce the pumping rate to zero as the water table drops below the cell bottom (Niswonger et al., 2011). Non-irrigation wells, such as public supply or thermoelectric wells are handled outside of the AG Package using one of the other MODFLOW well packages (Harbaugh, 2005).”**

10.) Line 413 - It also occurs that surface water is used as a supplement to a primary groundwater source. For example, groundwater pumping can be the main supply for irrigation until groundwater levels fall below a certain level or there are other administrative constraints on pumping, at which point the grower will purchase water from a reservoir. I suggest the Ag-package be updated to allow for this situation, which it apparently currently is not.

**Reply: It is true that the ag package cannot supplement surface water for a groundwater right. We agree that this capability should be pursued soon. I clarified this point by adding the following at lines 162-163: “However, this version of the AG Package cannot be used to represent the use of surface water to supplement a groundwater right.”**

11.) Consider a limitations section that outlines situations where the AG-package is not currently well suited, and how it may be revised in the future. This may come in part from comparison to the FMP2, and outline capabilities FMP2 has that Ag-package does not.

**Reply:I have provided explanations of the capabilities of the AG Package. From these descriptions, a reader can determine if the code is the right tool for their needs. It is beyond the scope of this paper to provide limitations to the application of this code because the limitations depend on the scope and needs of a project. Also, I am not providing a formal comparison to FMP because there is no way to create equivalent models that could be compared. FMP runs on monthly time steps and does not do soil water balance to discern irrigated water supply from precipitation.**

**We added the following lines on 649-650: “However, the effects of salinity stress on crops and crop-water use are not represented in the AG Package.”**

12.) Line 423, Line 440: 'Cells/HRUs' should be better explained, as in many cases the HRUs are much larger than the groundwater model cells it is unclear what flexibility there is to assign irrigation to either cells OR HRUs for instance.

**Reply:I clarified this issue on lines 167-170: “MODFLOW simulations require that AG Package features (irrigation diversions or wells) be associated with MODFLOW cells because surface spatial units in MODFLOW are cells. However, for GSFLOW simulations, surface spatial units are HRUs, and AG Package features must be associated with HRUs.”**

13.) Line 440 - That irrigation cannot be applied to only a partial area of an HRU (or model cell in some instances) appears to be a limitation that should be discussed.

**Reply: Additional information was provided on lines 179-182: “Irrigation cannot be applied to a partial area of a cell in MODFLOW, which could be a limitation in models with cells that are larger than fields. However, irrigation can be applied to a fraction of an HRU using the impervious fraction parameter, and if non-irrigated areas within an HRU can be represented as impervious.”**

14.) Line 452 - Clarify how the priority is established when multiple diversions and/or wells provide water to a single cell.

**Rely: Lines 185-188: The following lines were added to clarify this case: “If multiple SFR diversions supply irrigation to a single cell/HRU then the order that water is diverted occurs in the same order that the irrigation segments are specified. However, if multiple wells supply a single cell/HRU then the demand is split evenly among the wells.”**

15.) Line 479 - Clarify if all climate and vegetation data needed for these ETo calculations are already input in PRMS or if any additional data needs for AG package.

**Reply: The following sentence was added to clarify this point: Lines 202-204: “Other than including K\_c into the calculation of 〖ET〗\_o all other PRMS input does not change due to the AG Package.”**

16.) Line 507 - It's unclear if this paper is also providing an update to the UZF package, please clarify.

**Reply: The following lines were added to clarify the purpose of this information on lines 228-230: “This approach is recommended for the AG Package and ETDEMAND option, and a description is provided here because it was not included in the original UZF or GSFLOW documents.”**

17.) Line 544 - Return flow can also occur at the place of use, as discussed in the manuscript.

**Reply: The sentence was modified to clarify that return flows occur on fields as well on Lines 230-232: “Return flow can occur anywhere between a point of diversion and a place of use, including the area where irrigation is applied.”**

18.) Line 550 - Clarify how deep percolation, including for salt leaching, is handled.

**Reply: The following text was added to clarify this process on lines 236-239: “Groundwater return flow occurs as irrigation percolates beneath the UZF ET extinction depth or through the base of the soil zone defined in PRMS. There is no explicit representation of irrigation for salt leaching; however, specified amounts of irrigation can be applied to cells/HRUs to represent salt leaching.”**

19.) Line 570 - This paragraph appears to be out of place and should be in the irrigation delivery section.

**Reply: I respectfully disagree because irrigation return flow is often related to irrigation technology. Thus, in the context of return flow, it is important to know how assumptions about irrigation system types can be represented.**

20.) Section 4.2. Suggest discussion before section 4.2.1 that summarizes each of the three options discussed below, compare/contrast with each other, why user would choose 1 or another in different situations.

**Reply: Good suggestion the follow text was added to lines 267-273: “Irrigation demand can be specified directly by the user, or demand can be calculated by the model using the difference between simulated actual ET and the reference ET for well-watered conditions. Three options are provided in order to support applications to systems with differing amounts of data and differing agricultural practices. For example, if irrigation diversions and/or groundwater withdrawals are accurately known then option 1 described below is suitable. If irrigation withdrawals are uncertain, and crop consumption rates are more certain then options 2 or 3, depending on irrigation practices, are suitable.”**

21.) Section 4.2. Can more than 1 option be used at the same time for different areas of a model?

**Reply: the following sentence was added on lines 273-274: “Only one of the options can be used in a single simulation.”**

22.) Line 760. Is there any return-flow generated on runoff caused by a water application rate in excess of soil hydraulic conductivity?

**Reply: added the following clarification on Iines 318-319: “Surface water return flows that occur due to irrigation rates applied in excess of the vertical hydraulic conductivity of the field are not represented using approach 1.”**

23.) Line 882. Is Option 3 the same as Option 2 if parameters are established such that ETa = KcETo? If so please state.

**Reply: no because the application rate is specified for option 2, whereas the application rate is calculated by the model for option 3.**

24.) Section 4.2.3.1 - The way this document is organized it appears this section is only applicable to Section 4.2.3, whereas it really is applicable to all of Section 4.2.

**Reply: Good point. I changed this section to be 4.2.4 to be at the same level as the header for each option to make it clear this discussion applies to all 3 options.**

25.) Consider combining Section 5 and Section 6, or otherwise retitle Section 5 to clarify that this is only the setup for the Example Problems.

**Reply: Change section 5 title to “Description of Example Problems”**

26.) Line 1214 - Figure number is wrong here and in several places in the manuscript.

**Reply: Changed figure number call out to figure 3 on line 435.**

27.) Line 1586 - Unclear how setting a maximum would set this priority, wouldn't it be a minimum in upstream segment?

**Reply: Removed the word “priority” on line 511. This was a typo that made the text confusing.**

28.) Line 1875 - Suggest providing a plot of soil moisture over time.

**Reply: Thanks for this suggestion; however, as there are too many figures already, and I don’t think showing soil moisture will be any more informative than the precipitation that is already included in figure 9a.**

29.) Line 2045 - This sentence beginning here is confusing with the previous sentence, please clarify and add results from 2a to Figure 10. It is not intuitively obvious when the differences would be significant and this appears to be a useful outcome from the modeling presented, warranting further explanation.

**Reply: additional explanation is provided to clarify this statement on lines 599-603: Generally, the TRIGGER option results in significantly more surface water and groundwater irrigation withdrawal relative to the ETDEMAND option. This is because the irrigation rate is specified for the TRIGGER option and may not be optimal for an agricultural field. Whereas the irrigation rate is calculated as a function of the ET deficit for the DEMAND option and reflects the optimal irrigation rate.**

30. Line 184. “A common approach for simulating agricultural systems in regional integrated models is to estimate demands as a pre-processing step”.

In the Farm Package, crop-water demand and total farm delivery requirement are both estimated by the model (Schmid et al., 2006 - Page 8). The author needs to explain what he means by “estimate demand as a pre-processing step”.

**Reply: I made the following changes to the introduction to clarify this point and my explanation of thee Farm Package on lines 61-67: “A common approach for simulating agricultural systems in regional integrated models is to estimate irrigation demands as a pre-processing step, where a separate soil-water balance model is used to calculate demands. Irrigation demands are subsequently specified to a regional integrated model that does not simulate field soil-water balance (Dogrul et al., 2011). Another example is the Farm Process for MODFLOW-2005 that assumes the irrigation demand is independent of a farm’s soil water content, and that precipitation can be subtracted from reference ET to account for non-irrigated crop consumption (Hanson et al., 2010, 2014).”**

31. Line 293. The Title “4 Methods” is not representative of the content of the Section. It is not clear what methods are exactly described in the Section. I suggest adding a paragraph before this Section that explains the structure of the paper and what each subsequent Section of the paper discusses.

**Reply: Thank you for this great suggestion. The follow paragraph was added to lines 112-120: “General descriptions of the components in an agricultural system are provided here to set the context for the theoretical explanation of these components. This is followed by descriptions of the integration between the agricultural system and the regional hydrologic system. Details of the algorithms and model code developed for the AG Package are provided, as wells as explanation of the various options that can be used to simulate agricultural water use. Two different example models are described to illustrate the implementation of the AG Package, using both the MODFLOW and GSFLOW hydrologic modeling frameworks. Results of these models and their discussion are provided to highlight appropriate use of different model options and implications of these options in the model results.”**

32. Line 492. “Sub-irrigation is simulated by UZF assuming a linear capillary rise as a function of groundwater head”.

How the sub irrigation is different from Actual Crop ET (ETa) mentioned in Line 464? I gather that ETa in line 464 is UZF ET but sub irrigation is GW ET. If this correct, this needs to be explained in terms that are consistent with UZF package documentation. The term “Sub-irrigation” is not mentioned anywhere in UZF documentation. This is more of a general comment as the author mentions terms and refer to documents. However, those terms may be stated with different names on the referenced documents.

**Reply: We clarified the these statements on Line 222-224: “Total crop consumption for a cell (ETa) is calculated in UZF by summing the unsaturated zone and groundwater ETa, where groundwater ETa is a linear function of the water table elevation above the root depth and is zero when the water table is below the root depth (UZF input variable EXTDP).”**

33. Lines from 507 through 532.

I gather the new option mentioned here is added to the UZF package and is not relevant to the AG package. My understanding is that the AG package can be used with the current UZF package or the modified UZF package as described in those lines. If this correct, I suggest removing those lines altogether as they distract the reader from the main topics of the paper. If not, better explanations are needed on the relationship between the new option mentioned in those lines and the AG Package.

**Reply:Explanation for including the description of calculating ETa using the pressure gradient approach is on lines 227-229: “This approach is recommended for the AG Package and ETDEMAND option, and a description is provided here because it was not included in the original UZF or GSFLOW documents.”**

The whole subsection 4.1.2 seems to be unrelated to AG package. It discusses how ET is calculated from unsaturated and saturated zones in UZF and PRMS.

**Reply: One of the important and unique aspects of the AG Package is that it simulates ETa as a function of the simulated soil-water conditions. The formulation for simulating ETa as a function of soil water content in the ag fields is very important to the understanding of the AG Package and is therefore included in this article. I am not sure how the ETa formulation could be considered unrelated to the AG Package. No change made to the ms other than that described for the previous comment.**

34. Line 684. “irrigation demand is set using time varying surface water diversions specified in SFR tabfiles, or time varying pumping rates specified in AG”

Does that mean demand is estimated as pre-processing step? This contradicts the statement in Line 184.

**Reply: Yes, for option 1 the demand is specified and is calculated as a “pre-processing step.” However, demand is calculated by the model for options 2 and 3. This was clarified on lines 292-295: “Option 1 is the default approach (Fig. 2A), and irrigation demand is set using time varying surface water diversions specified in SFR tabfiles, or time varying pumping rates specified in AG. Alternatively, the user can have the model calculate irrigation demand using options 2 or 3, in which case the time varying surface water diversions specified in SFR tabfiles, or time varying pumping rates specified in AG represent maximum irrigation withdrawals.”**

35. Line 752 “FFn is the fraction of the diverted irrigation water that will be applied to cell n”.

How is that determined? Is it calculated by AG package or is an input to the model? Does the sum of FFn in all cells irrigated by a diversion or groundwater well needs to equal 1.0?

**Reply: On lines 322 and 323 I added the phrase “is the user-specified...” I provided additional introductory explanation about the 3 options for setting the demand on lines 281-288. FFn must be calculated external to the AG Package using the area of each cell as a fraction of the total area irrigated by a segment or well. This is a GIS exercise and requires maps of the irrigated lands that are irrigated by each withdrawal. This information is required for any analysis that links withdrawal points to irrigated lands, which is standard information for any agricultural water use study.**

36. Should Equation 6 read Qreturn = (1-EFSW) QSW + (1-EFGW) Qsup? or Qreturn = (1-EFGW) QGW

**Reply: Qgw is a general variable that can be either a groundwater right or supplemental surface water right. We added clarification Lines 325-326: “Groundwater return flow for a diversion and/or groundwater or supplemental well (Q\_return; L3/T-1) is calculated as:”**

37. Line 772 “If efficiency factors are used to represent crop consumption (EFSW and EFSW > 0), then ET should be made zero in UZF/PRMS cells/HRUs that contain fields”.

There is typo in this sentence; it should be EFGW and EFSW > 0.

**Reply:Thank you. We fixed this typo on line 330 of the new MS.**

Also, it is not clear how the ET should be made zero in UZF/PRMS. How will this affect parameter values in UZF/PRMS. Actual parameter names (as referenced in UZF and PRMS documentations) that should be made zero need to be identified (e.g., PET at cells contain fields in UZF should be made zero).

**Reply: we added the specific input variable names to lines 330-332: “If efficiency factors are used to represent crop consumption (〖EF〗\_sw and 〖EF〗\_Gw > 0), then ET should be made zero by setting the UZF input variable PET and PRMS input parameter JH\_coef (for the Jensen-Haise formulation) to zero for cells/HRUs that contain fields.”**

38. Lines 829, 833 “dimension L3/T-1”. It should read L3/T or L3T-1. A global search is needed as L3/T-1 seem to be stated throughout the document.

**Reply: done**

39. Terms in Equations 10 and 11

I think it is worth mentioning in the explanation of terms in Equations 10 and 11 that ETa is the UZF ET (calculated by UZF package) or ET calculated by PRMS. It is worth mentioning too that Kc ET0 in Equation 11 is PET in UZF package. As mentioned in earlier comment, better attempt is needed to explain the link between AG package with existing UZF, SFR, and PRMS. Such links can be made with the same parameter names and symbols in the paper as used in the respective documents. These terms seem to be explained in Equation 14 but I think it better be explained the first time they are mentioned.

**Reply: Added descriptions relating values in equations to UZF and PRMS model values on lines 355-357: “Q\_sum is the sum of crop ET for well-watered conditions for all cells (UZF input variable PET multiplied by the cell area) or HRUs (****PRMS calculated value PET times pervious HRU area) irrigated by a diversion or well (L3T-1); “**

40. Line 845 “where is the Tirr and TPeriod are ...”

Remove the word “is”.

**Reply: thanks, done.**

Also, on Equation 12, shouldn’t it be Tirr = TPeriod

**Reply: no because if a time step ends such that Tirr>Tperiod then they would not be equal, but the irrigation event would end.**

Is TPeriod an input to the AG Package? Should irrigation be on for only the specified TPerio, making the sign “=” is more appropriate than “³”. If this is not the case, better explanation is needed for equation 12.

**Reply: as stated on line 360: “where T\_irr and T\_period (T) are the elapsed and specified irrigation time, respectively” See explanation above about why a less than or equal sign is used.**

41. It is not clear what is the difference between Equations 11 and 15 (i.e. Qsum and QET, ww).

**Reply: definitions for all variables are included after each introduction of the variable in an equation.**

42. Figure 2-A. more explanation is needed in the figure.

For example, ETa is calculated by AG using efficiency factor ETa = eff\*Irr

Irr = (Qsw + Qgw)/A

It is implied from the figure that demand is always SFR diversions specified in SFR tabfiles. This is not always the case. For the avoidance of confusion, it is better to stick with the definition of the demand as in line 712 (i.e., volumetric rate for the irrigation period required for crop growth). Definition of demand as SFR input diversion may be implied throughout the document. I think such definition needs to be avoided.

**Reply: In figure 2 we added explanation that includes the irrigation efficiencies for the calculation of demand: “Demand set using specified irrigation efficiencies and pumping rates in AG input.”**

43. Line 1369. Each stress period represents a calendar month and are (is) divided into daily...

**Reply: thanks, fixed.**

44. Line 1382. Monthly ETww was specified in the UZF input file (as variable PET).

**Reply: done on line 484.**

45. Line 1403. ...using equation 15. Shouldn’t be Equation 16?

**Reply: done, now equation 17.**

46. Line 1405. ...Segment number 9. Shouldn’t Segment number 6?

**Reply: no, it is segment 9 that delivers water to the ag fields. This was labeled more clearly in figure.**

47. Line 1411. Example Problem 2: GSFLOW-Conjunctive use of SW and GW, ETDEMAND verses (versus) TRIGGER options

**Reply: thanks, fixed.**

48. Better discussion is needed for Figures 6 and 7. For example, why the ETa seem to equal sum of SW diversion and SUP Pumping. Shouldn’t be sum of SW diversion and SUP pumping be greater than ETa because of return flow? Why Cumulative crop consumption equals cumulative fine soil?

**Reply: added clarification on lines 534-536: “****For this example, irrigation demand is nearly equal to crop consumption due to the values of ET extinction depth, saturated water content, and natural rainfall.” Lines 558-559: “Irrigation demand is slightly less than crop consumption for fine soil due to rain-fed irrigation and the larger soil storage relative to coarse soil.”**