Interactive comment on "Evaluation of an extreme-condition-inverse calibration remote sensing model for mapping energy balance fluxes in arid riparian areas" *by* S.-H. Hong et al.

S.-H. Hong et al.

shong4@murraystate.edu

Received and published: 17 April 2015

Dear editor,

Co-authors adn I have responded comments from reviewers and prepared revised manuscript. Here are attached 3 files as follow;

1. Response_to_Reviewers_Hong.pdf

2. Final_Draft_Hong_Track Change.pdf

3. Final_Draft_Hong.pdf

Please let me know if there is any question.

Best regards, Sung-ho Hong

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 13479, 2014.

Fig. 1.

Response to Reviewers' Comments

Referees' responses are in black; authors' responses are in blue.

<u>Response to Anonymous Referee #1</u>

Summary: The authors present an application of SEBAL to semi-arid riparian regions in the US West. The study design is appropriate to the problem and the presentation of methods and results is clear throughout. I am not a SEBAL user, but my impression is that this paper will present a useful case study and a number of useful application tips for users of that system. Since SEBAL is a widely used model and semi-arid riparian zones are of particular interest for ET analysis I believe that publication of this paper in HESS is justified.
Answer: Thank you.

That said, I admit that I find the paper disappointing in some respects, as indicated in my major comments below. My overall impression is that the paper as it is currently written provides a technical resource for SEBAL users, but that the authors have missed the opportunity to put their analysis into the broader context of semi-arid riparian hydrology, or at least the broader context of available ET methods and datasets in these regions.

Major comments:

1. I find it odd that so many ET methods and products are listed in the introduction, yet the paper only presents internal analyses. It would be very interesting to know how the calibrated SEBAL estimates from this study compare to available ET estimates from MODIS (MOD16 and/or the UW product for CONUS), ALEXI, NLDAS, or other available datasets. Indeed, I had really hoped that in reading the paper I would learn whether calibrated SEBAL performs substantially better than other methods or publicly available products in these regions.
Answer: We fully agree that it would be interesting to know how the calibrated SEBAL estimates compare to those by operational ET products such as MOD16, ALEXI, NLDAS or other ones. However, the goal of this paper is "to conduct a thorough evaluation of the performance of SEBAL in arid riparian areas." Other international research groups have evaluated SEBAL for irrigated areas, forested catchments, cropped soil and desert surfaces. There are many scientists that believe SEBAL is designed for irrigation systems, hence it is an excellent idea to synthesize the multi-year research work in semi-arid riparian regions. The latter is an ecosystem requiring more global attention in water accounting frameworks of river basins. Comparison between SEBAL and METRIC at the one hand with other remote sensing based ET models at the other hand has been done before (TSEB, DISALEXI, IWMI Turkey experiment, Caren Jarmain South Africa). References to that could be provided
Co-author Hendrickx is involved with a statewide assessment of ET in New Mexico and evaluation of the MOD16, ALEXI and SSEBop operational ET products. The study started last fall and publication of its results will take a while to complete.
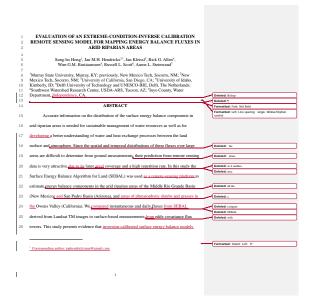
1

C6833

Fig. 2.

1 **EVALUATION OF AN EXTREME-CONDITION-INVERSE CALIBRATION**
2 **REMOTE SENSING MODEL FOR MAPPING ENERGY BALANCE FLUXES IN**
3 **ARID RIPARIAN AREAS**
4
5 Sung-ho Hong[1], Jan M.H. Hendrickx[2*], Jan Kleissl[3], Rick G. Allen[4],
6 Wim G.M. Bastiaanssen[5], Russell L. Scott[6], Aaron L. Steinwand[7]
7
8 [1]Murray State University, Murray, KY; previously, New Mexico Tech, Socorro, NM; [2]New
9 Mexico Tech, Socorro, NM; [3]University of California, San Diego, CA; [4]University of Idaho,
10 Kimberly, ID; [5]Delft University of Technology and UNESCO-IHE, Delft, The Netherlands;
11 [6]Southwest Watershed Research Center, USDA-ARS, Tucson, AZ; [7]Inyo County, Water
12 Department, Independence, CA.
13
14 **ABSTRACT**
15 Accurate information on the distribution of the surface energy balance components in
16 arid riparian areas is needed for sustainable management of water resources as well as for
17 developing a better understanding of water and heat exchange processes between the land
18 surface and atmosphere. Since the spatial and temporal distributions of these fluxes over large
19 areas are difficult to determine from ground measurements, their prediction from remote sensing
20 data is very attractive due to its large areal coverage and a high repetition rate. In this study the
21 Surface Energy Balance Algorithm for Land (SEBAL) was used as a remote-sensing platform to
22 estimate energy balance components in the arid riparian areas of the Middle Rio Grande Basin
23 (New Mexico) and San Pedro Basin (Arizona), and areas of phreatophytic shrubs and grasses in
24 the Owens Valley (California). We compared instantaneous and daily fluxes from SEBAL
25 derived from Landsat TM images to surface-based measurements from eddy covariance flux
26 towers. This study presents evidence that inversion-calibrated surface energy balance models

Corresponding author: jashendrickxnmt@gmail.com

1

C6834

1 **EVALUATION OF AN EXTREME-CONDITION-INVERSE CALIBRATION**
2 **REMOTE SENSING MODEL FOR MAPPING ENERGY BALANCE FLUXES IN**
3 **ARID RIPARIAN AREAS**
4
5 Sung-ho Hong[1], Jan M.H. Hendrickx[2*], Jan Kleissl[3], Rick G. Allen[4],
6 Wim G.M. Bastiaanssen[5], Russell L. Scott[6], Aaron L. Steinwand[7]
7
8 [1]Murray State University, Murray, KY; previously, New Mexico Tech, Socorro, NM; [2]New
9 Mexico Tech, Socorro, NM; [3]University of California, San Diego, CA; [4]University of Idaho,
10 Kimberly, ID; [5]Delft University of Technology and UNESCO-IHE, Delft, The Netherlands;
11 [6]Southwest Watershed Research Center, USDA-ARS, Tucson, AZ; [7]Inyo County, Water
12 Department, Independence, CA.
13
14 **ABSTRACT**

15   Accurate information on the distribution of the surface energy balance components in

16 arid riparian areas is needed for sustainable management of water resources as well as for

17 developing a better understanding of water and heat exchange processes between the land

18 surface and atmosphere. Since the spatial and temporal distributions of these fluxes over large

19 areas are difficult to determine from ground measurements, their prediction from remote sensing

20 data is very attractive due to its large areal coverage and a high repetition rate. In this study the

21 Surface Energy Balance Algorithm for Land (SEBAL) was used as a remote-sensing platform to

22 estimate energy balance components in the arid riparian areas of the Middle Rio Grande Basin

23 (New Mexico) and San Pedro Basin (Arizona), and areas of phreatophytic shrubs and grasses in

24 the Owens Valley (California). We compared instantaneous and daily fluxes from SEBAL

25 derived from Landsat TM images to surface-based measurements from eddy covariance flux

26 towers. This study presents evidence that inversion-calibrated surface energy balance models

* Corresponding author: janhendrickxnmt@gmail.com

Fig. 3.

C6835