Response to interactive comment on “At which time scale does the complementary principle perform best on evaporation estimation?” by Liming Wang et al.

(Reviewers comments in Italic and responses in upright Roman)

Anonymous Referee #1

General response: Thank you for the timely review. We are very happy to hear the critical voice although we do not agree with many of them. We would like to discuss these contradictions with the reviewers. In the following we provided point-by-point responses as follows.

-The MS is carelessly written. It should be thoroughly rechecked for grammar, typos, language constructs.

Response: Thank you for the comments. We will go through and revise the manuscript thoroughly and hire some language experts to help polish the manuscript again.

-For example, the AA method is mentioned several times before it is explained.

Response: Thank you for pointing out this problem. we had provided the full name for it when the first time it is mentioned (**Line 54-56, hereafter all lines numbers are based on the tracked version**). Also, we moved the explanation from the methodology part to the introduction part.

-Also, the first asymmetric AA method was of Kahler and Brutsaert (2006), and not by Brutsaert and Parlange (1998).

Response: According to our reading, Brutsaert and Parlange (1998) provided the following equation in their paper:

$$E = \left[(1+b)E_0 - aE_{pa}\right]/b$$

where, E_0 has the same meaning of E_{po} in our manuscript (i.e., potential evaporation), and a is a pan coefficient, b is an asymmetric parameter. Our statement “the CR was extended to a linear function with an asymmetric parameter (Brutsaert and Parlange, 1998)” refers to this equation.

Kahler and Brutsaert (2006) summarized the previous work of Brutsaert and Stricker (1979), Brutsaert and Parlange (1998), and Brutsaert (2005) and gave the equation:

$$(1+b)E_0 = C_pE_{pa} + bE$$

where, C_p is a constant parameter. We can see that this equation holds the same format with Brutsaert and Parlange (1998) after appropriate transformation (and replacing C_p with a). It may be the first time it was called “asymmetric AA”. Thank you.

-Also, nobody reads the original work of Bouchet (1963), it seems, as it is in French. That may be the reason for frequent misquoting it. My understanding is that he never proposed a symmetrical CR. Even Brutsaert in his seminal book (1982) is controversial about this issue. The authors should clarify this issue though.

Response: Yes, the original work of Bouchet (1963) is French. In our institute of Tsinghua University, we have a PhD student coming from France, and he had translated this paper into English several years ago. We are pleased to provide the English version of Bouchet (1963) at the end of the response for the reference. After reading this paper, we suggest that the contribution of Bouchet (1963) should be respected.

Equation (5) and Figure 2 of Bouchet (1963) show a symmetrical complementary relationship:

$$ETP + ETR = 2ETP_0$$

where, ETR is the energy corresponding to the real evapotranspiration, ETP is corresponding to E_{pa}, and ETP_0 is corresponding to E_{po}.

In the book of Brutsaert (1982, p224-225), the above equation is cited as equation (10.35), and Brutsaert said that Bouchet (1963) arrived at the complementary relationship and admit Bouchet's approach contains worthwhile ideas and led to further developments. Brutsaert thought this method is not used widely because the assumption is strict and it did not provide exactly measures of E_{pa} and E_{po}.

Thank you.

-I do not really see what we gain from this study. The high NSE value for the month comes about because its high variance between months and it is already being long enough to smooth things out.

Response: The aim of this study is to investigate at which time scale the complementary principle performs best on evaporation estimation. Based on this reviewer's comment, we understand that the reviewer gained that complementary functions perform best at the monthly scale. Actually, it's exactly what we want to convey to the audience. We did not find the evidence in previous studies or theoretical derivation which had already revealed this conclusion. Without these results, it is still uncertain how long is "enough to smooth things out". It could be 7 days, 30 days or 90 days. We agree with the reasons for the high NSE value at the monthly scale given by the reviewer, these reasons are also discussed in our manuscript (**Line 236- 241**). The "high variance" can be corresponding to our explanation about "variabilities of x and y" (**Line 240**), and the "smooth things out" can be corresponding to our explanation of RMSE. Thank you.

-I bet that between Mays, Junes, Julys, etc., the NSE value would not be better than for the seasons and years.

Response: We are not very clear about this comment. In the current version, the study periods are from April to September for the Northern Hemisphere and from October to March for the Southern Hemisphere. Did the reviewer mean that if the study periods are shortened (e.g, from May to July), the NSE values at the monthly scale will be worse than for the seasons and years? We have provided the results for May to July in Table R1. In this situation, the seasonal result is equal to the annual result and there is one seasonal result (May to July) each year. These results still support our conclusion. The NSE values at the monthly scale ($NSE_H = 0.38$ and $NSE_B = 0.32$) are higher than those at the seasonal/annual scale ($NSE_B = -0.07$ and $NSE_B = -0.05$). Thank you for providing an opportunity to test the uncertainty in the length of study periods.

Table R1. The evaluation merits (NSE, R^2 and, RMSE in W m^{-2}) of the two generalized complementary functions from May to July

	Month	Season/Year
NSE_H	0.38	−0.07
NSE_B	0.32	−0.05
R^2_H	0.63	0.56
R^2_B	0.63	0.56
$RMSE_H$	12.17	8.86
$RMSE_B$	21.51	8.81

-The low value for the annual time-scale is a bit worrisome as it means that these two chosen methods cannot replicate any long-term trends in ET rates to acceptable accuracy, which diminishes their potential values for long-term hydrological modeling.

Response: Yes, the complementary functions perform worse in estimating *E* at the annual scale. To the best of our knowledge, this point had not been thoroughly discussed previously. We did not recommend choosing the annual scale as the timestep to estimate *E* because of the low efficiency. However, we can still replicate the long-term trends in *E* rates by adopting the monthly timestep. Thank you.

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REAL EVAPOTRANSPIRATION AND POTENTIAL CLIMATIC SIGNIFICANCE

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The real evapotranspiration of an area represents the water really lost in the form of vapor, the potential evapotranspiration, the water likely to be lost under the same conditions when it is not limiting factor any more. The knowledge of these two data is obviously indispensable to study the circulation of water or to define the needs for the water of the cultures.

We propose to show the connections that exist not only between ETP and ETR, but also between these terms and the various elements of the energy report (the total radiation, the radiation of long wave, etc…), by using the method of the energy assessment. The simple relations that we will establish will permit to better define the climatic significance of ETR and ETP. It will then be possible to specify their respective variations when we will try to modify the climate in more or less vast zones, either by irrigating, or by changing the cover of the ground.

I -- STARTING ASSUMPTION -- SCALE OF THE ASSESSMENT

The study of the energy assessment supposes the preliminary definition of the system limits. To avoid taking into account the phenomena of accumulation and restitution of heating during the diurnal and night phases, the assessment will relate to one 24-hour period, the variations of temperature are then generally negligible.

The system includes the whole of the vegetable mass, a superficial section of ground, and a lower section of the atmosphere. Dimensions of these sections are just as the nycthemeral variations of temperature remain appreciable. The system exchange of heating with outside during this period takes place without the phenomena of radiation and evaporation, by conducting in deep layers of the ground (Qs) and by convecting (Qa) towards the high layers of atmosphere.

If this system itself is located in a zone that does not present the same climatic characteristics for various reasons, there will be the side exchanges of energy on the walls which has to be analyzed.

The side exchanges by conduction in the ground are negligible. It is not the same side exchange as in the atmosphere due to the movements of the standardized mass of air which we will indicate under the general name “of the oasis effects”. Given the heterogeneity of a point to another of the type ground, the vegetable cover, the phenomena of evaporation, side movements of energy or “the oasis effect” are the rules under the natural conditions.

We can schematically represent the phenomenon of the oasis effect of the following manner (Fig. 1). If in a flat and homogeneous zone, an heterogeneity appears (the characteristics of the ground such as the thermal conductibility, the specific heating, the moisture or the nature of vegetable cover, the different ETR, etc…), it develops in the direction of the air circulation a disturbed zone where the medium factors find to be modified compared to the general climate because of heterogeneity. The oasis effect thus corresponds to an intrusion of the external system on the studied system, not only by its immediate edges but by the whole of the limit of the disturbed zone.

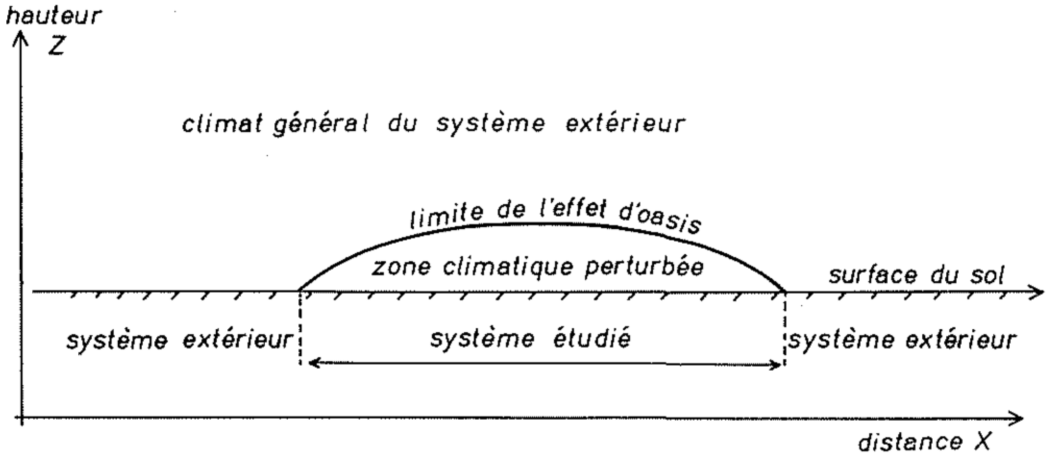

Fig. 1 -- Importance of the disturbed climatic zone according to the dimension of the heterogeneous system compared to the external system.
hauteur --- height;
climat général du système extérieur --- the general climate of external system
limite de l'effet d'oasis --- the limit of the effect of oasis
zone climatique perturbeé --- the perturbed climatic zone
surface du sol --- the ground surface
système extérieur --- the external system

The disturbance rises all the more in height since the heterogeneous zone is extended. It is always presented in the form of a "flat lens" for which the thickness is weak compared to horizontal dimensions. We can thus define, for each meteorological scale and each scale of heterogeneity, an oasis effect of corresponding scale (table 1) which gives the side exchange of energy Q_1 Q_2 Q_3 Q_4 Q_5. These are the exchanges that we will try to specify later on in the equation of the energy assessment and which we must take into account to define horizontal dimensions to give to the system.

As we propose to connect ETR to the different terms of the energy assessment, we must consider ETR as uniform on all the surfaces of the system. Thus it comes to determine from which minimum surface, the real evapotranspiration can affect the climatic factors that we use to define the climate, by acting on the energy assessment. It is only when we attain this minimum surface that we will be ensured to have an excellent connection between the climatic factors (θ_a, θ_r, wind, etc.) and ETR, since these factors will not only be considered any more as a more or less direct possible cause, but also as an effect. The minimum zone presenting the character of uniformity will have to thus be just as the disturbance reaches the level to which one refers to have the climatic data. Those are collected to 2 m above the ground with instruments having time-constants of the order of a minute. We will thus, a priori, have to consider only the thermal phenomena having a higher scale or equal to that of turbulence itself (> e_2).

The heating exchange of greater scale (e 3 4 5) are integrated in Qa term of the energy assessment. They thus contribute to define the climate. Thus, the “oasis effects” of great scale such as those existing between the maritime zones and the continents are found in the climatic data of the meteorological networks. In the same way, on the scale of the 1/2 day, the breezes of sea or ground can be treated as the oasis effects of higher scale or equal to e3.

The heating exchange related to the scales lower than e2 are from the concepts even of the negligible scale and can be regarded as the simple movements of standardization within the system which does not affect the climate just as we define it.

To respect the scale of turbulence, the zone considered for the energy assessment should thus take the character of uniformity on the distances of a few hundreds of meters, to see a few kilometers. The minimum extent on the surface is thus of the order from 10 to 100 ha.

TABLE 1

Scale (symbol in the text)	Scale of time	Scale of distance	Corresponding oasis effect (symbol in the text)
Molecular e1	10(-9) second		Q1
Turbulent e2	1s. to several minutes	A few hundreds of meters	Q2
Associated convection and movements e3	10 minutes to several hours	Several kilometers	Q3
Cyclonic e4	3 to 4 days	1000 to 2000 km	Q4
Planetary e5	10 to 30 days	5000 to 10,000 km	Q5

We define in Meteorology the scales of turbulence which permit to neglect the phenomena whose scale is small compared to the macroscopic movement considered.

On the whole of this surface, ETR will be uniform by hypothesis. If the real evapotranspiration around this system is different from that located inside, there will be the oasis effects; those will be all the more important scale because the zone considered will be large; within the framework of our definition, they will be lower or equal to turbulence. The potential evapotranspiration will be thus variable within the system according to the distance to these edges. The potential evapotranspiration then will be considered in the center of the device, where it is weakest or strongest. If the surface of the system were more important, ETP in the center would decrease or increase, but the climatic factors as they are generally considered, would then start to be affected, which would be against the starting hypothesis since we propose to define VETP of the initial climate and not Y ETP modified by the variations of evaporation.

In conclusion, ETP can be defined in the level of the meteorological shelter to 2 m only like the potential evapotranspiration in the center of a uniform zone at the view point of ground, vegetation or evaporation and at least few tens of hectares.

Thus, the reasoning which will follow will not be able to apply strictly to even the homogeneous zones which do not have the sufficient size and a fortiori, to the heterogeneous zones. We will thus encounter the great difficulties in defining ETR or ETP as the climatic factors in the zones of transition, because the oasis effects of scale lower than that used to define the climate, will modify the suggested equalities. These cases will meet in particular for the complex checkerwork that represents the vegetation of a zone of mixed-farming, for the small oases in arid zone, the clearings in the forest zones, for the edges of the massive forest or the maritime coasts. However, the suggested equations provide an approach for the problem.

II – ASSESSMENT Of ENERGY (*)

Suppose an uniformed system corresponding to the preceding conditions. During a period of 24 hours, the energy assessment brought to the unit of area is,

$$(1) \qquad (1-a)Rg + (1-a')Ra - a''\sigma T^4 + Q = E - C = ETR$$

the equation which gives the real evapotranspiration of the area considered. Thus, ETR more or less limited by the intervention of the factor “water” plays an essential part in the interaction of the physical data of the climate by these terms σT^4, Ra and in certain measurement Ra or even Rg.

ETP corresponds, by definition, in case the available energy is the only factor limiting the evaporation. Study the passage from ETR to ETP in the previously defined system. Let us indicate by ETP0 the value of the potential evapotranspiration when ETR is equal to ETP.

Suppose this condition to be realized

$$(2) \qquad ETR = ETP = ETP_0$$

Admit that for an independent reason of the energy phenomena, ETR decreases. This case could result in a period of dryness, of the maturity of vegetation, of its cut, etc…The reduction in ETR releases an energy q1 such as,

$$ETP_0 - ETR = q_1 . \tag{3}$$

With the scale considered, this modification of balance inside of the system does not affect the total radiation and only intervenes very slightly on the Ra term via the temperature and the moisture of the low atmospheric layers. The only important modification which will bring to the temperature and the turbulence, will cause a modification of ETP. Under the best conditions, i.e. if the transformation does not modify the exchanges of the system with outside, the energy returning available (q1) should correspond to an increase of ETP. Thus, without the modification of the initial climate from the energy point of view and in particular without the variation of the different primitive oasis effects, we will have

$$ETP = ETP_0 + q_1 \tag{4}$$

Where, by considering (3),

$$ETP + ETR = 2 ETP_0 \tag{5}$$

(*) We will admit as positive the energy received on the surface of the ground, as negative the energy lost. The following symbols will be used:

a --- albedo, the reflection fraction of the total radiation (expressed in percentage)
a’ --- the reflection fraction of the atmospheric radiation
a” --- the emissivity
Rg --- the total radiation (the solar radiation $\leq 5\mu$ received on an horizontal surface)
Ra --- the atmospheric radiation of the long wave $> 5\mu$
σT^4 – the radiation of the ground at the absolute temperature T with an emissivity equal to the unit
E --- the energy involved by the evaporation
C --- the energy involved by the condensation
Q --- the energy exchanged by the conduction-convection by the considered system with outside
Qs --- the energy exchanged by the conduction in the ground
Qa --- the energy exchanged by the conduction-convection in the air. Qa comprises the exchange of heating of the various scales
ETR --- the energy corresponding to the real evapotranspiration
ETP --- the energy corresponding to the potential evapotranspiration

Thus, for a given climate, all would occur as if there were symmetry between ETR and ETP compared to a constant ETP0. Very generally, the transformation will not occur without the modification of the exchanges with outside and the equalities will transform themselves into inequalities.

$$(6) \qquad ETP + ETR \leqslant 2ETP_0$$

By using the equality (5) and by clarifying the values of Q according to the scales, the general equation (1) can be written as,

$$(7) \qquad ETP + (1-a)Rg + (1-a')Ra - a''\sigma T^4 + Qs + Q_3 + Q_{4.5} = 2ETP_0$$

(1 - a) Rg’, ETP0, $Q_{4.5}$ are not affected by the relative variation of ETR, and ETP related to the availability of the water. σT^4, Ra, Qs and even Q_3 are on the contrary variable. We can thus put (7) in the following form, by grouping the variable terms in a function g,

$$(8) \qquad ETP = 2ETP_0 + g - (1-a)Rg - Q_{4.5}$$

and according to (5),

$$(9) \qquad ETR = (1-a)Rg' + Q_{4.5} - g.$$

For the given values ETP0, Rg’, $Q_{4.5}$, ETR is a decreasing function of g, then ETP is an increasing function. When ETR = 0, ETP takes the maximum value corresponding to 2ETP0. Moreover, according to (9),

$$(10) \qquad g = (1-a)Rg' + Q_{4.5}$$

When the water is not a limiting factor, ETR becomes by definition equal to ETP. The variation of ETR explains then that of ETP. The maximum value likely to be taken under these conditions by ETR corresponds to the possible maximum value of ETP. According to (9), ETR will be maximal when g will be null. In fact, g that essentially represent the net radiation of the long wave (σT^4 - Ra), engine of night cooling, could not be positive, otherwise the night amplitude of the temperature would change the sign and the night temperatures would be increasing at night. We have then to the maximum the non limiting water with the factor,

$$(11) \qquad ETR_{\max} \text{ ou } ETP_{\max} = (1-a)Rg' + Q_{4.5}.$$

This maximum value of ETR or ETP under these conditions could not thus even be exceeded when ETR = 0. We have thus in this case,

$$(12) \qquad ETP \leqslant (1-a)\,Rg' + Q_{4,5}$$

where considering (5),

$$(13) \qquad 2\,ETP_0 \leqslant (1-a)\,Rg + Q_{4,5}$$

which gives,

$$(14) \qquad ETP_0 \leqslant 0{,}5[(1-a)\,Rg + Q_{4,5}]\,.$$

We also deduce,

$$(15) \qquad ETP \leqslant g$$

or

$$(16) \qquad ETP \leqslant a\sigma'' T^4 - (1-a')\,Ra + Qs + Q_3\,.$$

The potential evapotranspiration can thus be expressed according to the radiative assessment of the long wave (σT^4 , R'a) in the measurement where the term (Q3) is not too large over a period of 24 hours. The equation (12) permits to understand how it is possible to relate ETP for a given place and certain duration of the day to the nychthemeral amplitude of temperature(the maximal temperature --- the minimal temperature) which is in relation to these exchanges of radiation of the long wave during the cooling phase of the night.

Finally, the equality ETR + ETP = 2 ETP0 is put in the form,

$$(15) \qquad ETR + ETP \leqslant (1-a)\,Rg + Q_{4,5}\,.$$

In addition, if we indicate by ε the ratio ETR/ETP,

$$(16) \qquad \varepsilon = \frac{ETR}{ETP}$$

εhas the meaning of an index of the relative evapotranspiration equal to 1 for the areas where ETR = ETP and equal to 0 for the desert areas.

The equation (13) permits then to express respectively ETP and ETR.

$$(15) \qquad ETP \leqslant \frac{(1-a)\,Rg + Q_{4.5}}{1+\varepsilon}$$

$$(16) \qquad ETR \leqslant \frac{\varepsilon[(1-a)\,Rg + Q_{4.5}]}{1+\varepsilon}$$

DISCUSSION

The potential evapotranspiration can thus be evaluated in two different ways over multiple periods of 24 hours when there are no important changes of temperature,

-- or from the radiation of long wave (σT^4 , Ra), which integrates via the temperature the oasis effects of great scale

--- or from the total absorptive radiation (1-a)Rg, the oasis effects of great scale (Q_4, Q_5) and of an index εof the relative evapotranspiration.

ETP can not thus be defined only according to the energy factors independently from the water factor. We will study two limited cases:

When ε= 1

$$ETR = ETP \leqslant 0{,}5[(1-a)\,Rg + Q_{4.5}].$$

When ε= 0 ETR = 0

$$ETP \leqslant (1-a)\,Rg + Q_{4.5}.$$

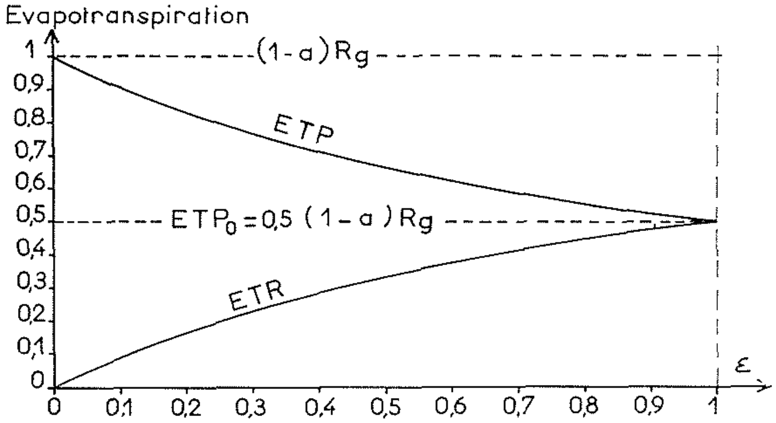

Fig. 2 – The possible maximal variation of ETR and ETP according to ε= ETR/ETP, the exchange of heating of great scale $Q_{4.5}$ being null

The potential evapotranspiration thus varies to the maximum between 2 limiting values from *2 ETPo = (1 - a) Rg + Q4.5* to ETP0 = 0,5[(1 -a)Rg+ Q4.5] when ETR varies from

0 to ETP. The figure 2 gives the variation of ETR and ETP according to εwhen the oasis effects of great scale are negligible.

Thus, for the equatorial zones where we can admit ε = 1, ETP should be inferior or equal to (1 - a) Rg. Hydrous assessments of some river basins provided by L. TURKISH emphasize an annual ETP about half of the radiation total suitable for be absorbed by an abundant and wet foliage. The hydrous assessments of some river basins provided by L. TURC emphasize an annual ETP in order of the half of the total radiation likely to be absorbed by an abundant and wet foliage.

The same conclusion would be valid for the very large stretches of water such as the seas. However, in the vicinity of the coasts, we will have to take into account of the disturbances introduced by the “calorific wheels” different from the ground and the sea which systematically produce the oasis effects in the form of breeze of sea and of ground of scale equal to or higher than e3. These side exchanges are still increasing with the vicinity of the desert coasts.

If we consider a zone strongly sprinkled such as a very vast oasis in a desert, we can admit that on the edge, we are under the conditions of the desert climate ETR = 0, whereas in center ETR is equal to ETP. Thus from the edge to the center, we can justify from the preceding equations a variation which is from simple to double, all other conditions remaining equal, according to the importance of the guard ring placed around to standardize the conditions. If the preceding inequalities do not give the variation of ETP according to the distance of the considered perimeter, they make it possible to define the higher and lower limits and to find by a very different way, the curves of SUTTON, taken again by CALDER, DUFFEL and LATTAN on the reduction of ETP according to the guard ring (Fig. 3).

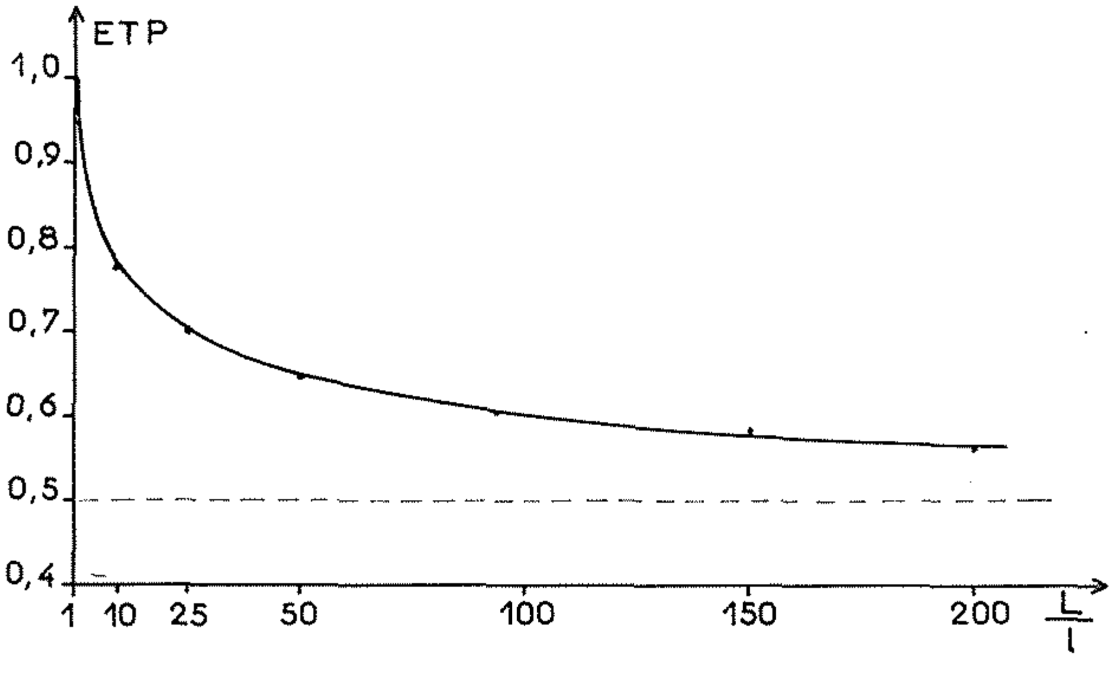

Fig. 3 – The variation of ETP according to the ratio L/l from the radiation of the guard ring to that of the measured zone giving ETP.

It will be noted that in an area of mixed-farming, the ETR are very different from each other. This result that ETP will be itself different; but the oasis effects will have, for the effect trending to standardize them, certain zones used as the relatively hot sources, others as the relatively cold sources. According to the importance of the surfaces, the oasis effects will raise different scales. ETP will not only correspond to the average value at the scale superior to that of the turbulence which will not translate ETP of the more reduced surfaces, since it will correspond to the average ETR of the same zone and not ETR of each field.

The preceding whole of the equations supposes that when we pass from ETP to ETR, the transformation is done without perturbing the previous climate. This reasoning is valid only at the limit and will all the more far from the reality, because the ratio between ETR and ETP will vary quickly in the time, or its uniformity zone will possess the dimensions far from the ones corresponding to the scale that defines the climate. Nevertheless, if we consider an uniform zone sufficiently extensive, they allow to define the limits of possible variation of ETR or ETP all linking to the different terms of the assessment *(Rg,* Rnet of the long wave).

Note that the water provision of irrigation has an effect on lowering ETP while highing ETR. This double action contributes to improve strongly the vegetable production. This lowering of ETP, all other conditions remaining equal, will be all the more marked since the treated surface will be important. However, we note that to consider, in a very dry region, ETR as the neighbor of ETP, it will be necessary to irrigate the surface having a very high scale superior to e2. It's thus about a surface corresponding to several Km^2 (several hundreds of hectares). In this case, it will be possible to lower strongly ETP and when the scale of the surfaces grows, one will be able to consider the limit, and to arrive at dividing ETP by two. This decrease of ETP for the high scale corresponds not only to a reduction of water consumption, but also to an important improvement of its efficiency.

CONCLUSION

The study of the energy assessment of an uniform region (ground, vegetable cover, nutrition in water) done during a period of 24 hours, allows to establish the simple relations between the real and potential évapotranspiration and the terms of the energy assessment *(Rg, Rnet of the long wave*). These relations were established with a series of hypotheses that we do not meet generally in the natural conditions; they provide, however, an approach of ETR and of ETP and emphasis the role played by the totally absorbed radiation. The existing compensation between ETP and ETR translated by simple relation ETP + ETR equal to constant for a certain totally absorbed radiation, allows to explain the variations of ETP from these of ETR. We then can have an indication on the order of magnitude of the climatic modifications that we can await of a change of the vegetable cover or of a water provision by carrying out the irrigation to a sufficient scale.

TABLE 2

Real Evapotranspiration (ETR) in the Equatorial zone

I --- observed values --- Extract of the thesis of L. TURC "The water assessment of the grounds --- relations amongthe precipitations, the evaporation and the flow"

Current water, with eventually the surface of the pouring basin and the period of doing the report	Rain in mm	0°C	ETR
a) Java			
Tji Anten (240 km2) 17 years	4.935 mm	21°	1.188 mm
Tji Kapundung	2.650 mm	18°	1.070 mm
b) South America			
Amazone (report not known)	1.900 mm	24° 5	1.245 mm
c) Africa			
Congo (report not known)	1.400 mm	22° 5	1.030 mm
Sanaga à Edea	1.610 mm	23°	1.095 mm

II --- Maximum theoretical values of annual ETR

Total Radiation (Annual average expressed in cal /cm2 /day)	Albedo	
	5%	10%
350	1.040 mm	990 mm
400	1.190 mm	1.130 mm
450	1.340 mm	1.270 mm

The theoretical maximum values of annual ETR were calculated from the equality $ETR = ETP = ETP0 = 0,5\ (1 \sim a)Rg$ X 365.

The albedo 5% and 10% can correspond to those from a dense forest to the humid foliage.