

REMOTE MONITORING OF SOIL SALINIZATION IN
THE SOUTH ARAL SEA REGION

Turdimambetov I.R.¹, Oteuliev M.O.¹, Ismailova A.K.²

*Karakalpak State University named after Berdakh
Kazakh National Agrarian Research University*

Annotation

In the article the questions of remote monitoring of soils are examined in the region of South Aral Sea Area. It is marked that a concept «Ecological monitoring» is the action of continuous control, supervision, and prognosis development of natural environment to the base of the controlled from remote sensing methods. It is set that depending on the depth of bedding of subsoil waters, features of soils and tilled culture decoding signs will change. Experience of estimation of dynamics of soiled of soils by comparison of space pictures of different years allowed to establish that for determination of orientation of process of soil the pictures of long-term row are required, otherwise a wrong idea can be got about the orientation of salt process.

Key words: Environmental monitoring, salinity, desalinization process, ameliorative condition, irrigated lands.

Introduction

Environmental monitoring as a modern scientific direction in the study of the natural environment began to develop from the beginning of the seventies of the last century, which was due to two reasons: 1) the deterioration of the ecological situation; 2) technical progress capable of providing new means of operational monitoring of the state of the natural environment.

At present, the concept of «environmental monitoring» means continuous control, observation and predictive development of the natural environment (including all-natural environments - water, air, soil and their properties) based on modern operational research methods, among which the main place is occupied by remote sensing methods confirmed by ground-based studies [1].

The main tasks and concepts of environmental monitoring were formed in the last century in the UNESCO program “Man and Biosphere” and several other publications. According to these documents, the purpose of monitoring is to effectively manage the state of the environment in the conditions of dynamically developing ecosystems. As a result of many years of scientific research, a wealth of material has been accumulated, proving the necessity and possibility of applying a system of measures to eliminate the causes of deterioration of land properties.

Materials and methods

The objects of research in the work were soil samples taken from the territories previously used for irrigation in all regions of the Republic of Karakalpakstan. Soil sampling was carried out from a depth of 5 cm on average, since it is at this depth that plant roots actively develop [8].

Currently, the surveyed area is in the process of reclamation and natural restoration. Reclamation is carried out by planting trees, and natural restoration is associated with the process of succession under the influence of natural factors, without any special measures. Statistical processing was carried out using the procedures of static analysis of the Microsoft Excel application package.

Results and discussion

As is known, at present it is customary to distinguish three levels of environmental monitoring: a) global, monitoring the state of the slowly changing background, which is associated with natural

changes in the biosphere as a whole, as well as changes occurring in vast territories; b) regional, reflecting the state of the environment within a relatively limited region; c) local, which controls the processes occurring under conditions of intensive use of natural resources at a specific object or local area.

The criterion for choosing the object of observation should be its high sensitivity to any changes in the natural environment, as well as the typicality of the object of observation, which must be statistically proven. Priority attention in environmental monitoring should be given to the synchronism and comparability of the observations, as well as the development of software system and hardware monitoring.

One of the directions of environmental monitoring in the South Aral Sea region is assigned to observations of the state of soils, as well as their properties. It is known that salinity is one of the main characteristics of soils in arid regions, limiting fertility and determining their genetic and ameliorative properties. Salinity reacts quickly to changes in natural conditions and anthropogenic impacts and is an informative property of the state of soils, therefore, in arid regions, it is precisely tracking changes in salinity that allows us to obtain the necessary information about the processes taking place in soils. In what follows, for brevity, this system will be called “soil salinity monitoring”. It should be pointed out that the problem of organizing monitoring of soil salinity is currently being widely discussed in foreign literature [4, 5, 6], etc.

Currently, work is underway to organize monitoring of agricultural lands in the South Aral Sea region (Figure 1). In connection with the extremely difficult situation on irrigated lands, we believe that the proposed developments of specialists and scientists to create monitoring of soil salinity in irrigated lands can be useful today for creating monitoring of salinity in irrigated soils in the Republic of Karakalpakstan [6, 7].

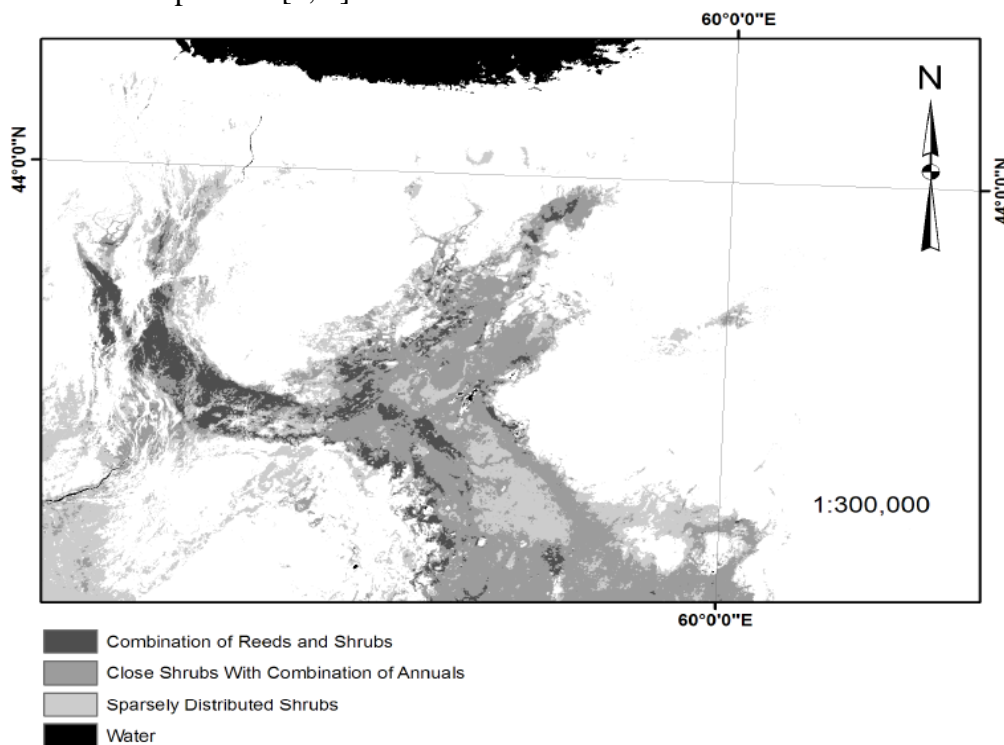


Fig. 1. Vegetation land cover classification

Depending on the depth of the groundwater, the characteristics of the soil and the cultivated crop, the deciphering signs will change. However, for similar ameliorative conditions and one crop, they are stable, that is, once having substantiated the decoding signs with ground surveys and analytical data characterizing the salinity of soils, it is not required to clarify the decoding signs during repeated surveys. But at the first stage, decryption signs must necessarily be substantiated by ground-based methods. Comparison of remote sensing materials, characterizing the state of cotton fields and meeting the above requirements, makes it possible to assess the area of saline soils and the dynamics of soil salinization in the territory occupied by cotton as the main crop in this region.

Conclusion

The experience of assessing the dynamics of soil salinization by comparing satellite images of different years made it possible to state that to determine the direction of the salinization – desalinization process, long-term images (5–10 years) are required, otherwise an incorrect idea of the direction of the salt process may be obtained [2, 3]. Modern high-resolution satellite imagery and modern computer programs for image processing, as well as the experience of previous years, make it possible to solve the problem of creating a permanent monitoring of salinity in irrigated arid and arid regions of Central Asia.

References:

1. Виноградов Б.В. Аэрокосмический мониторинг экосистем. М.: Наука, 1984. 320 с.
2. Панкова Е.И., Соловьев Д.А. Дистанционный мониторинг засоления орошаемых почв. Рос. Академия сельскохозяйственных наук. М.: Почв. ин-т им. В.В. Докучаева, 1993. 191 с.
3. Рухович Д.И. Многолетняя динамика засоления орошаемых почв центральной части Голодной степи и методы ее выявления. Автореф. дис. ... к.б.н. М., 2009. 25 с.
4. Савин И.Ю., Отаров А. и др. Выявление многолетних изменений площади засоленных почв Шаульдерского орошаемого массива по космическим снимкам Landsat // Бюл. Почв. ин-та им. В.В. Докучаева, 2014.
5. Ambast S.K. Monitoring and evaluation of irrigation system performance in saline irrigated command using satellite remote sensing and Бюллетень Почвенного института им. В.В. Докучаева. 2014. Вып. 74. gis // Interne Mededeling, Report No. 471. DLO Winand Staring Centre, Wageningen, the Netherlands, 1997. -106 p.
6. Fernandez-Buces N., Siebea C., Cramb S., Palacio J.L. Map-ping soil salinity using a combined spectral response index for bare soil and vegetation: A case study in the former lake Texaco, Mexico // J. of Arid Environments. 2006. V. 65 (4). P. 644–667.
7. Shrestha D.P., Farshad A. Mapping salinity hazard: an integrated application of remote sensing and modeling-based techniques // Remote sensing of soil salinization. Impact on land management, 2009. P. 257–272.
8. Хлебникова Г.М. Сравнительная характеристика биологической активности почв и подпочвенных осадочных пород: Автореф. дисс. ... канд. биол. наук. М., 1980. 24 с.

ДИСТАНЦИОННЫЙ МОНИТОРИНГ ЗАСОЛЕНИЯ ПОЧВ ЮЖНОГО ПРИАРАЛЬЯ

Турдымамбетов И.Р., Отеулиев М.О., Исмаилова А.К.

*Каракалпакский государственный университет имени Бердаха, Узбекистан
Казахский национальный аграрный исследовательский университет, Казахстан*

Аннотация

В статье рассматриваются вопросы дистанционного мониторинга почв в регионе Южного Приаралья. Отмечается, что понятие «Экологический мониторинг» представляет собой действие непрерывного контроля, наблюдения и прогнозирования развития природной среды на основе контролируемых с помощью методов дистанционного зондирования. Установлено, что в зависимости от глубины залегания грунтовых вод, особенностей почв и возделываемой культуры будут меняться расшифровочные признаки. Опыт оценки динамики засоления почв путем сравнения космических снимков разных лет позволил установить, что для определения направленности процесса засоления почвы требуются снимки многолетнего ряда, в противном случае может быть получено неверное представление об направленности процесса засоления.

Ключевые слова: Экологический мониторинг, засоление, процесс опреснения, мелиоративное состояние, орошаемые земли.

ОҢТҮСТІК АРАЛ ӨҢІРІ ТОПЫРАҚТАРЫНЫҢ ТҮЗДАНУЫНА ҚАШЫҚТЫҚТАН МОНИТОРИНГ ЖҮРГІЗУ

Турдымамбетов И.Р., Отеулиев М.О., Исмаилова А.К.

*Бердах атындағы Қарақалпақ мемлекеттік университеті, Өзбекстан
Қазақ ұлттық аграрлық зерттеу университеті*

Аңдатпа

Мақалада Оңтүстік Арал өңіріндегі топырақты қашықтықтан мониторингтеу мәселелері қарастырылады. "Экологиялық мониторинг" ұғымы қашықтықтан зондтау әдістерінің көмегімен бақыланатын табиғи ортаның дамуын үздіксіз бақылау, бақылау және болжау әрекеті болып табылады. Жер асты суларының тереңдігіне, топырақтың сипаттамаларына және өсірілетін дақылға байланысты декодтау белгілері өзгеретіні анықталды. Әр түрлі жылдардағы ғарыштық суреттерді салыстыру арқылы топырақтың тұздану динамикасын бағалау тәжірибесі топырақтың тұздану процесінің бағытын анықтау үшін көпжылдық сериялардың суреттері қажет екенін анықтады, әйтпесе тұздану процесінің бағыты туралы қате түсінік алынуы мүмкін.

Кілт сөздер: экологиялық мониторинг, тұздану, тұщыландыру процесі, мелиорациялық жай-күй, суармалы жерлер.